SOUTHWEST RESEARCH INSTITUTE ASSISTANCE TO NASA IN BIOMEDICAL AREAS OF THE TECHNOLOGY UTILIZATION PROGRAM

MONTHLY REPORT

Contract No. NASW-1867
SwRI Project No. 13-2538

Chief, Dissemination Branch, Code (UT)
Technology Utilization Division
Office of Technology Utilization
NASA
Washington, D. C. 20546

January 1973

SOUTHWEST RESEARCH INSTITUTE ASSISTANCE TO NASA IN BIOMEDICAL AREAS OF THE TECHNOLOGY UTILIZATION PROGRAM

MONTHLY REPORT

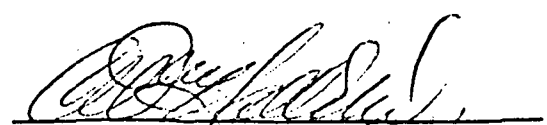
1 January 1973 - 31 January 1973

Contract No. NASW-1867
SwRI Project No. 13-2538

Prepared for

Chief, Dissemination Branch, Code (UT)
Technology Utilization Division
Office of Technology Utilization
NASA
Washington, D.C. 20546

Approved:



C. William Hall, M.D.
Director
Department of Bioengineering

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

TABLE OF CONTENTS

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

SUMMARY OF ACTIVITIES FOR THE PERIOD

ACTIVITY:	NUMBER: This Month	Cumulative Since 1/71	On Page
PROBLEMS			
New Problems Accepted	6	190	4
Problems Rejected	0	4	6
Problems Inactivated	25	293	7
Problems Reactivated	3	10	8
Total Problems Currently Active	92		
PROBLEM STATEMENTS			
Preliminary Problem Statements Prepared	6	190	9
Problem Statements Submitted for Review	0	8	17
Problem Statements Disseminated	0	9	18
Responses to Problem Statements	1	49	19
Cumulative Problem Statements Prepared		190	
SEARCHES			
RDC Computer Searches Initiated	3	149	21
Other Searches Initiated	0	5	25
Searches Evaluated by Team Personnel	7	148	26
Searches Evaluated by Investigator	0	66	34
APPLICATIONS ENGINEERING			
New Candidated Submitted	2	28	35
Candidates Active as of Last Month		8	38
Currently Active A. E. Candidates	9		38
Candidates Dropped	0	--	--
Cumulative A. E. Candidates Submitted		--	--
TECHNOLOGY APPLICATIONS			
Potential Techn. Appl. as of Last Month		38	40
Potential Techn. Appl. Claimed	8	46	40
Items Dropped from Pot. Techn. Appl.	0	1	
Currently Active Potential Techn. Appl.	--		
Technology Applications Claimed	0	30	59
CONTACTS			
Contacts with Current User Institutions	38	2008	81
Contacts with Potential User Institutions	14	171	87
Contacts with NASA Centers	79	1523	90
Other Contacts	59	1376	99
APPENDICES			106

SPECIAL ACTIVITIES REPORT

Space-age devices help disabled

Space technology is being adapted to help the sick and disabled.

A puff of breath . . . a twitch of the toe . . . a turn of the head . . . a glance of the eye.

With one or other of these slight movements an immobile patient adjusts a hospital bed, opens or closes a window or door, controls room temperature, changes channels and volume on a television set, turns pages of a book, dials a telephone, signals a nurse or performs other tasks for comfort and convenience.

This new degree of freedom is in prospect for limbless and paralysed bed-bound patients, through adaptations of ultra-sensitive control systems developed in the US space programme. It could eventually brighten the lives of a great number of people. In the United States alone the number of immobilised patients is estimated at 100,000.

The first system is at present being installed in a special room in the Huntsville Hospital, Alabama. First tests will be on healthy people and then on patients.

In use, the system is fitted to a bed and employs a device sensitive to slight pressure from a patient who wants to actuate a variety of comfort and assistance appliances. Depending on individual capacity, the patient selects appliances either by puffs of breath against small paddles suspended in front of the face, by slight turning of the head, by a toe- or finger-operated switch, or by eye movement.

The prototype unit has six channels which a patient selects, but later models could offer a larger number.

At the heart of the new system is a specially developed electronic logic unit, through which the pressure control device feeds signals to an electric bed-adjuster and other appliances.

The system was developed by a biomedical-engineering team at the Southwest Research Institute, Texas, working in a NASA programme designed to transfer space technology to practical uses on earth.

'Patients who are paralysed in all four limbs and multiple amputee patients are almost totally dependent for support on patient care personnel for any activities or interest in which they can participate,' says Dr David Culclasure, leader of the Institute team.

'The morale of such patients is markedly improved and the demands on patient care personnel greatly reduced by any device or procedure which generates self-sufficiency capabilities,' he says.

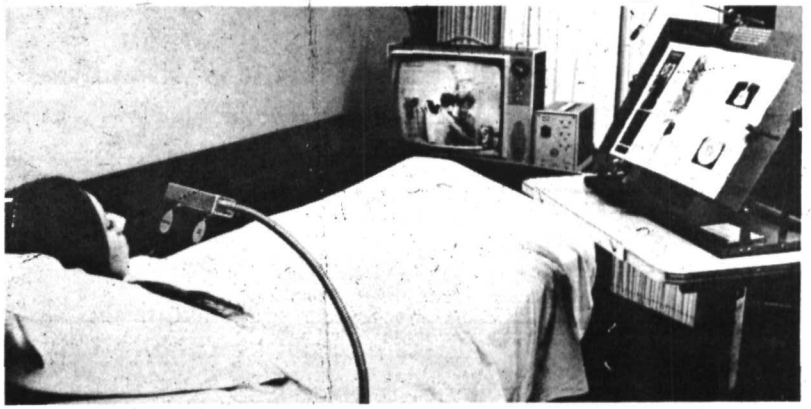
Work leading to the new system resulted from a request from the Hot Springs (Arkansas) Rehabilitation Centre, which approached NASA on the possibility of adapting slight pressure devices to aid bed-bound patients.

The centre specifically asked for control systems in addition to the NASA-developed eye switch, which some patients find uncomfortable.

The eye-actuated switch was devised early in the space programme when there was concern about how an astronaut would throw switches should his arms become immobilised by high-gravity forces during take-off and re-entry. Unmanned tests showed that gravity forces did not rise that high and the devices were never used on astronaut missions.

Engineers at NASA's Langley Research Centre in Hampton, Virginia, proposed the breath-puff switch and collaborated with the Texas group in early developments.

Complete specifications and drawings for the system being installed — with its variety of pressure switches — have been made available to the Arkansas centre and other rehabilitation complexes.



By blowing on the paddles this disabled patient can operate a variety of appliances.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

I. PROBLEMS

A. NEW PROBLEMS ACCEPTED

The following is a list of new Biomedical Problems accepted during the period covered by this report:

Problem Number	Problem Title	Health Area	Probable Solution Requirements
AEB-5	Motion Sensor to Provide Biofeedback to Blind Persons Unaware of Involuntary Movements	03	A
AEB-6	Arc/Angle Measurement of Travel of Cane for the Blind	03	G
BMC-7	Automated Device For Administering Visual Field Tests to Glaucoma Patients	02	A
BMC-8	Self-Generating Oxygen Supply	18	F
TTU-3	Rate Monitor for Self-Injurious Behavior	06	A
TTU-4	Nocturnal Activity Monitor	06	A

Health Area Impact

01 - Communicable Disease
02 - Multiphasic Health Screening
03 - Rehabilitation Medicine
04 - Artificial Organs
05 - Organ Assist Devices
06 - Mental Health
07 - Heart Disease Treatment
08 - Cancer
09 - Ecology
10 - Health Care Cost Reduction
11 - Remote Health Services
12 - Medical Personnel
13 - Kidney Disease
14 - Infant Mortality
15 - Respiratory Disease
16 - Surgical Procedures
17 - Dental Medicine
18 - Basic Medical Research
19 - Other

Requirement Code

A - Analytic Instrument Systems
B - System Components
C - Computer Programs
D - Prosthetic Devices
E - Materials/Chemicals
F - Therapeutic Equipment
G - Other

HEALTH AREA IMPACT CATEGORIES	Analytic Inst. Systems	System Components (Equipt.)	Computer Programs	Prosthetic Devices	Materials/Chemicals	Therapeutic Equipment	Other	TOTAL
TOTAL								6
Communicable Disease								
Multiphasic Health Screening	1							1
Rehabilitation Medicine	1						1	2
Artificial Organs								
Organ Assist Devices								
Mental Health	2							2
Heart Disease Treatment								
Cancer Detection								
Ecology								
Health Care Cost Reduction								
Remote Health Services								
Medical Personnel								
Kidney Disease								
Infant Mortality								
Respiratory Disease								
Surgical Procedures								
Dental Medicine								
Basic Medical Research						1		1
Other								

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

I. PROBLEMS
IMPACT AREA/REQUIREMENT MATRIX

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

I. PROBLEMS
B. PROBLEMS REJECTED

Listed below are the Biomedical Problems which were rejected during the period covered by this report. Brief descriptions of each Problem and specific reason(s) for rejection are on the following pages:

Problem Number	Problem Title	Rejection Code

None during this report period.

Rejection Code:
A-Apparent solution commercially available.
B-Apparent solution not expected in present or foreseeable NASA technology.
C-Problem not biomedically oriented.
D-Problem not amenable to problem-solving oriented goals.
E-Problem too broadly stated; not sufficiently defined.
F-Problem "Priority" too low.
G-Other

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

I. PROBLEMS
C. PROBLEMS INACTIVATED

The following is a list of Biomedical Problems inactivated during the period covered by this report:

Problem No.	Prof. Effort	Time Elapsed Since Accepted	Inactivation Code
AEB-3	14.5 Hours	7 Months	F
BMC-6	13.0 Hours	4 Months	F
BVA-4	212.5 Hours	33 Months	A
GLM-39	21.5 Hours	20 Months	E
GLM-40	42.5 Hours	18 Months	F
HPH-1	52.5 Hours	27 Months	F
HUV-20	139.5 Hours	25 Months	F
HUV-23	55.0 Hours	8 Months	F
NMA-10	52.5 Hours	31 Months	F
RRC-1	66.0 Hours	26 Months	E
RRC-2	126.0 Hours	25 Months	A
SNM-13	39.0 Hours	34 Months	F
SNM-14	34.5 Hours	34 Months	F
SNM-15	52.5 Hours	34 Months	F
SNM-26	78.5 Hours	7 Months	A
SWR-1	99.0 Hours	12 Months	A
TCB-2	49.5 Hours	16 Months	A
TCD-1	105.0 Hours	22 Months	A
TCD-2	94.0 Hours	22 Months	A
TCD-3	93.5 Hours	22 Months	A
TCD-5	125.5 Hours	21 Months	F
TCD-9	98.5 Hours	16 Months	A
UFM-6	NA	33 Months	C
UTM-37	73.0 Hours	17 Months	A
WLH-2	68.5 Hours	17 Months	A

Inactivation Code:
A - Technology Application Accomplished
B - Investigator Has No Further Interest
C - Investigator Has Found His Own Solution
D - Investigator Has Left Institution
E - No Applicable NASA Technology Was Found
F - Other

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

I. PROBLEMS
D. PROBLEMS REACTIVATED

The following is a list of Biomedical Problems reactivated during the period covered by this report:

Problem No.	Reason(s) for Reactivation
UFM-7	Latest contact with Dr. James Frost, Baylor College of Medicine in Houston via John Sigmon, SwRI/MSC has yielded a possible solution to his problem on mass EEG computer screening programs. The Problem Originator is still interested in a solution, so coordination efforts will continue.
GLM-46	Problem was originally combined with GLM-45 for work on a "blanket" solution. For all practical purposes, since potential technology had been worked out on the individual aspects of the combined problems, the problems were once again maintained separately.
GLM-47	Included in explanation of GLM-46

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

II. PROBLEM STATEMENTS

A. PRELIMINARY PROBLEM STATEMENTS PREPARED

Listed below are the Preliminary Problem Statements which were prepared during the period covered by this report. The following pages present copies of these statements.

Problem No.	Problem Title
AEB-5	Motion Sensor to Provide Biofeedback to Blind Persons Unaware of Involuntary Movements
AEB-6	Arc/Angle Measurement of Travel of Cane for For the Blind
BMC-7	Automated Device For Administering Visual Field Tests to Glaucoma Patients
BMC-8	Self-Generating Oxygen Supply
TTU-3	Rate Monitor for Self-Injurious Behavior
TTU-4	Nocturnal Activity Monitor

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

PRELIMINARY PROBLEM STATEMENT

IDENTIFICATION

Problem No: AEB-5 Date of Preparation: 1-31-73
Problem Title: Motion Sensor to Provide Biofeedback to Blind Persons Unaware of Involuntary Movements Date of Acceptance: 1-6-73
Institution: Arkansas Enterprises for the Blind, Little Rock, Arkansas
Department: Training
Investigator: Elmo Knoch, Director of Training
Consultant/Coordinator (if any): Jack Johnson
BATeam Personnel: Charles J. Laenger

WHAT IS NEEDED: Motion sensor with auditory or tactile feedback for blind persons who unknowingly rock back and forth.

MEDICAL SPECIALTY: 03 REQUIREMENT: A

BACKGROUND: Blind persons who acquire the habit of rocking back and forth need to be made aware of this movement by a small, inconspicuous device mounted on the head. Thus, these persons with such aids could easily break this habit.

CONSTRAINTS AND SPECIFICATIONS: Cost effectiveness of the device is of prime importance.

OTHER COMMENTS:

PROBLEM STATUS: Known NASA developed technology will be scanned for preliminary approach to the solution. If warranted, further searching will be done on physiological and psychological functions implicated.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

PRELIMINARY PROBLEM STATEMENT

IDENTIFICATION

Problem No: BMC-7 Date of Preparation: 17 January 1973
Problem Title: Automated Device For Administering Visual Field Tests to Glaucoma Patients Date of Acceptance:
Institution: Brooke General Hospital, Fort Sam Houston, Texas
Department: Ophthalmology
Investigator: Dr. Simmons
Consultant/Coordinator (if any):
BATeam Personnel: Culclasure/Dreyer

WHAT IS NEEDED: An automated device capable of administering visual field tests to glaucoma patients, so as to provide accurate and reproducible data with regard to deterioration caused by the disease state.

MEDICAL SPECIALTY: 02 REQUIREMENT: A

BACKGROUND: It is estimated that up to 5% of the population suffers from glaucoma, a disease resulting in hardness of the eye, atrophy of the retina, cupping of the optic disk, and -- unless brought under medical control -- blindness. A standard means for assessing inroads made by the disease involves periodic testing of the visual field, which is sensitive to deterioration as the disease progresses. Presently available equipment used to perform visual field tests does not provide high quality data because they yield results which are not sufficiently accurate and reproducible. Moreover, the objective qualities of conventional tests tend to be diluted by minimum human involvement. This is because the person administering the test sequence is required to move the visual stimulus over the patient's visual field and record the observer's comments. This allows human reaction time and judgment to play too large a role in the interpretation and recording of results precluding needed accuracy and reproducibility.

CONSTRAINTS AND SPECIFICATIONS: An automated system -- not relying on human manipulation -- is desirable.

OTHER COMMENTS:

PROBLEM STATUS: NASA technology developed at AMES Research Center in connection with visual sensitivity testing is applicable. It is hoped that resources of the U. S. Army Medical Department will be made available for exploitation.

PRELIMINARY PROBLEM STATEMENT

IDENTIFICATION

Problem No: AEB-6 Date of Preparation: 1-31-73
Problem Title: Arc/Angle Measurement of Travel of Cane for the Blind Date of Acceptance: 1-6-73
Institution: Arkansas Enterprises for the Blind, Little Rock, Arkansas
Department: Training
Investigator: Elmo Knoch, Director of Training
Consultant/Coordinator (if any): Jack Johnson
BATeam Personnel: Charles J. Laenger, Charles B. Dreyer

WHAT IS NEEDED: A means for measuring the arc or angle of travel of a mobility cane used by a blind person.

MEDICAL SPECIALTY: 03 REQUIREMENT: G

BACKGROUND: A blind person using a cane needs to know the magnitude of the arc of travel to make certain that the cane is covering sufficient area as he travels. Otherwise, he may not locate an obstacle or change in elevation of his path.

CONSTRAINTS AND SPECIFICATIONS: Apparatus must be cost-effective and light enough so that the added weight will not render the cane inefficient for the level of sensitivity developed by the person who uses the cane.

OTHER COMMENTS:

PROBLEM STATUS: A computer search keyed to NASA developed accelerometers will be initiated.

PRELIMINARY PROBLEM STATEMENT

IDENTIFICATION

Problem No: BMC-8 Date of Preparation: 26 Jan 1973
Problem Title: Self-Generating Oxygen Supply
Date of Acceptance: 26 Jan 1973
Institution: United States Army Combat Developments Command, Ft. Sam
Department: Houston, Texas
Investigator: Captain Bernard E. McMasters, Jr.
Consultant/Coordinator (if any): Col. F. O. DeSautels (USA Ret.)
BATeam Personnel: Jean Carter, SwRI, John Sigmon, SwRI/MSC
David F. Culclasure, Ph. D., SwRI

WHAT IS NEEDED: An apparatus to extract oxygen with a purity of 99.5 percent for individual patient use, while hospitalized.

MEDICAL SPECIALTY: 18 **REQUIREMENT:** F

BACKGROUND: There is a need for providing an apparatus that will provide medical oxygen at the patient's bedside or in the operating room. Such a capability will assure a ready availability of oxygen for therapeutic and/or anesthetic purposes. The availability of devices capable of supplying oxygen for field medical units would greatly reduce the current logistical requirements of procurement, inspection, storage, and transportation of oxygen cylinders.

CONSTRAINTS AND SPECIFICATIONS: Apparatus must be capable of producing 10 liters of pxygen per minute at 760mm of Hg and 20°C. The device may be powered by 110/120 volt 50/60/400 Hz AC or 24 volt DC. The total package must be minimal in size and weigh no more than 40 pounds. The operator must be able to determine purity of the oxygen produced, preferably with a built-in test device. Maintenance required shall not exceed 30 minutes for each 20-hours of operation. The extractor must produce USP oxygen of 99.5 percent purity under any atmospheric condition though chemical, biological or radiologic contaminant may be present. The equipment must be reliable and simple to operate.

OTHER COMMENTS: On relevant technology to date: One proposal is a chemical system using a chelate compound with an affinity for oxygen. The chelate in the system absorbs oxygen when exposed to air. When the air supply is cut off, the chelate is heated, causing it to give up oxygen. The oxygen is pumped into an accumulator which serves as the oxygen source. Other closed loop system variations employ type of fuel cell process for electrolysis of water. In closed loop system, oxygen exhaled into system is recycled for further use. Other methods proposed include electro-chemical,

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

PRELIMINARY PROBLEM STATEMENT... continued.

Problem No. BMC-8, "Self-Generating Oxygen Supply"

electrolysis of oxide and a high temperature system. The latter two systems would separate the oxygen from oxides of metal at temperatures as high as 1800°F.

PROBLEM STATUS: A computer search of all NASA relevant technology will be initiated as soon as possible. Approach to the problem will be monitored through NASA Headquarters because of cost/feasibility/location-of-developmental-work guidelines.

PRELIMINARY PROBLEM STATEMENT

IDENTIFICATION

Problem No: TTU-3 Date of Preparation: 1-15-73
Problem Title: Rate Monitor for Self-Injurious Behavior
Date of Acceptance: 1-6-73
Institution: Texas Tech University
Department: Psychology
Investigator: Dr. William Landers, and James Griffin
Consultant/Coordinator (if any): Sam Schiflett
BATeam Personnel: Charles J. Laenger, Charles B. Dreyer

WHAT IS NEEDED: A rate monitor to accurately count the number of self-injurious behavioral responses in order to determine appropriate schedules of reinforcement.

MEDICAL SPECIALTY: 06 REQUIREMENT: A

BACKGROUND: Within the last ten years, investigators have used various means to effectively supress self-injurious behaviour (SIB); i.e. face slaps, head-to-floor butts, etc. However, a tremendous investment in money and trained personnel are necessary to monitor the retardates' behavior and to consequate their non-SIB with appropriate reinforcement. In addition, with severely retarded individuals, latency of reinforcement (i.e. reward or punishment should be delivered .50 sec. or less to be effective) is extremely critical if the individual is to understand why he is receiving the reinforcement. One of the basic parameters of effective reinforcement is accurate knowledge of the rate of SIB.

CONSTRAINTS AND SPECIFICATIONS: The monitor should provide a continuous permanent record of the SIB up to a rate of 45 responses per minute. The monitor should be compatible with a 28 v D.C. power supply. Reinforcement will consist of some form of auditory, visual, or tactual stimulation delivered to the retardate contingent upon his non-SIB.

OTHER COMMENTS:

PROBLEM STATUS: Sufficient NASA developed technology is available to construct such a unit, but a computer search will be conducted for support and will include physiological and motivational information.

PRELIMINARY PROBLEM STATEMENT

IDENTIFICATION

Problem No: TTU-4 Date of Preparation: 1-15-73
Problem Title: Nocturnal Activity Monitor
Date of Acceptance: 1-6-73
Institution: Texas Tech University
Department: Psychology
Investigator: Dr. William Landers & James Griffin
Consultant/Coordinator (if any): Sam Schiflett
BATeam Personnel: Charles J. Laenger, Charles B. Dreyer

WHAT IS NEEDED: An apparatus is needed which will record the activity of gross bodily movements of individual retardates during the course of their sleeping hours.

MEDICAL SPECIALTY: 06 REQUIREMENT: A

BACKGROUND: Group living situations for the retarded, emotionally disturbed and criminal are environments that are typically very restrictive socially and perceptually. Routine rest/activity schedules in group living situations are imposed without carefully considering the effects of the surrounding physical environment. A current trend of altering the physical surroundings to counteract the influences of an impoverished environment is being initiated by various institutions at a great expense. An especially large amount of money and time is being spent to provide individual sleeping arrangements on the hypothesis that this will give the retardates a more normal living environment conducive to restful sleep. However, there is no empirical evidence to suggest or disprove the large investments which are being placed into these efforts, due to a lack of basic knowledge of activity/rest cycles of the mental retardates.

CONSTRAINTS AND SPECIFICATIONS:
After the prototype model has been tested, the unit should be low cost, since a large number will be needed for future evaluations of various sleeping arrangements.

OTHER COMMENTS:

PROBLEM STATUS: A NASA computer search will be initiated for both materials/instrumentation and environmental impact studies.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

II. PROBLEM STATEMENTS

B. PROBLEM STATEMENT DRAFTS SUBMITTED FOR REVIEW

Listed below are the Problem Statement drafts for the Biomedical Problems which were submitted for review during the period covered by this report. Copies of these Problem Statements are found on the following pages.

Problem No.	Problem Title

None during this report period.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

II. PROBLEM STATEMENTS
C. PROBLEM STATEMENTS DISSEMINATED

Listed below are Problem Statements for the Biomedical Problems which were disseminated during the period covered by this report. Copies of these Problem Statements if different from those previously submitted for review, are presented on the following pages.

Problem No.	Distribution	Date Sent
	None during this report period; however, individual problems are sent to various individual NASA Centers where specialties are known. See appropriate contact reports.	

II. PROBLEM STATEMENTS

D. RESPONSES TO PROBLEM STATEMENTS RECEIVED

On the following pages are copies of responses to Problem Statements for the Biomedical Problems listed below which were received during the period covered by this report.

Problem Number	Distribution Date	Date of Receipt	Field Center	Initial Team Evaluation of Applicability/Utility of Response
LVA-8	2 Oct 1972	4 Jan 1973	Langley	Information received on a commercially available plastic called "Pactene" seemed to fill all needs expressed by Problem Originator. Samples will be sought and material fully evaluated before problem is inactivated.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LANGLEY RESEARCH CENTER
HAMPTON, VIRGINIA 23365

JAN 04 1972

REPLY TO
ATTN OF: 139A/TU&APO

DEC 29 1972

Dr. David F. Culclasure
Manager, NASA Biomedical Applications Program
Southwest Research Institute
8500 Culebra Road, P.O. Drawer 28510
San Antonio, Texas 78284

Subject: Highly Abrasive-Resistant Mixing Bowls

Enclosed is a response that I received to the subject problem from Mr. Warren Kelliher of this center. The problem, which is not numbered, was forwarded to me with your letter of October 2, 1972. Enclosed is a copy of the letter from Dr. David B. Milne which contains the problem.

Should you desire to discuss the suggested solution with Mr. Kelliher, he can be contacted at AC 703 827-2045.

John Samos
Technology Utilization and
Applications Programs Officer

2 Enclosures

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

III. SEARCHES

A. RDC COMPUTER SEARCHES INITIATED

On the following pages are copies of RDC Computer Search forms for the Biomedical Problems listed below, for which searches were initiated during the period covered by this report.

PROBLEM No.	RDC SEARCH No.
AEB-6	RECON
TTU-3	RECON
TTU-4	RECON

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM
COMPUTER SEARCH REPORT

IDENTIFICATION

Problem No. and Title: AEB-6 "Arc/Angle Measurement of Travel of Cane for the Blind"
RDC: RECON Search Title: See key words
Search No. _____

INITIATION

Date Search Initiated: 1-27-73 Search Terms:
Accelerometers, strain gage accelerometers, DO NOT INCLUDE gravimeters or gyroscopic pendulums.

TEAM EVALUATION

Date Search Results Received: _____ No. Citations: _____
Date Evaluation Completed: _____ No. Relevant Citations: _____
Team Evaluation: _____

Date Relevant Citations Sent to Researcher: _____

RESEARCHER EVALUATION

Date Evaluation Received from Researcher: _____
Researcher Evaluation: _____

No. Documents Requested by Researcher: _____

DOCUMENTS

Date Documents Ordered: _____ Date Received: _____
Date Documents Sent to Researcher: _____
Researcher Evaluation: _____
_____ No. Hits: _____

HITS: _____ _____ _____ _____ _____
_____ _____ _____ _____ _____

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM
COMPUTER SEARCH REPORT

IDENTIFICATION

Problem No. and Title: TTU-3 "Rate Monitor for Self-Injurious Behavior"
RDC: RECON Search Title: See key words
Search No. _____ (Note: search will be keyed to physiological and motivational impact.)

INITIATION

Date Search Initiated: 1-27-73 Search Terms:
Self-stimulation, reinforcement (psychology), stimuli, morale, incentives, detatchment, emotions, introversion, lethargy, boredom(psychological effects), monotony.

TEAM EVALUATION

Date Search Results Received: _____ No. Citations: _____
Date Evaluation Completed: _____ No. Relevant Citations: _____
Team Evaluation: _____

Date Relevant Citations Sent to Researcher: _____

RESEARCHER EVALUATION

Date Evaluation Received from Researcher: _____
Researcher Evaluation: _____

No. Documents Requested by Researcher: _____

DOCUMENTS

Date Documents Ordered: _____ Date Received: _____
Date Documents Sent to Researcher: _____
Researcher Evaluation: _____
_____ No. Hits: _____

HITS: _____ _____ _____ _____ _____
_____ _____ _____ _____ _____

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM
COMPUTER SEARCH REPORT

IDENTIFICATION

Problem No. and Title: TTU-4 "Nocturnal Activity Monitor"

RDC: RECON Search Title: See key words

Search No. _____ (Note: search will be keyed to environmental and psychological impact.)

INITIATION

Date Search Initiated: 1-27-73 Search Terms:

Hypersomnia, insomnia, REM state, rest, dreams, confinement, isolation, sensory depravation, environment simulators, test chambers earth environment, communes(sociology), dependence, group dynamics social isolation, race factors.

TEAM EVALUATION

Date Search Results Received: _____ No. Citations: _____

Date Evaluation Completed: _____ No. Relevant Citations: _____

Team Evaluation: _____

Date Relevant Citations Sent to Researcher: _____

RESEARCHER EVALUATION

Date Evaluation Received from Researcher: _____

Researcher Evaluation: _____

No. Documents Requested by Researcher: _____

DOCUMENTS

Date Documents Ordered: _____ Date Received: _____

Date Documents Sent to Researcher: _____

Researcher Evaluation: _____

No. Hits: _____

HITS: _____ _____ _____ _____ _____

_____ _____ _____ _____ _____

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

III. SEARCHES
B. OTHER SEARCHES INITIATED

The following is a list of Biomedical Problems for which searches other than RDC Computer searches were conducted during the period covered by this report:

Problem No.	Description of Search and Search Results

None conducted during this report period.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

III. SEARCHES
C. SEARCHES EVALUATED BY TEAM PERSONNEL

On the following pages are copies of RDC Computer Search forms for the Biomedical Problems listed below for which searches have been evaluated by the Team personnel during the period covered by this report.

Problem No.	Search No.	No. Citations	No. Relevant
CRH-1	T639	62	9
CRH-3	T638	56	0
CRH-5	T637	16	3
CRH-6	T636	24	1
MDA-1	T641	228	7
SLU-1	T640	47	2
UTM-39	T635	80	P.O. will eval.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM
COMPUTER SEARCH REPORT

IDENTIFICATION

Problem No. and Title: CRH-1 "Differentially Inflated Segmented Seat Cushion"
RDC: RECON Search Title: See terms
Search No. T639

INITIATION

Date Search Initiated: 12-21-72 Search Terms:
Inflatable cushion, air cells, automatic air valves

TEAM EVALUATION

Date Search Results Received: 1-9-73 No. Citations: 62
Date Evaluation Completed: 1-22-73 No. Relevant Citations: 9
Team Evaluation: Possible reference help.

Date Relevant Citations Sent to Researcher: P. O. prefers team evaluation and ordering of necessary documents

RESEARCHER EVALUATION

Date Evaluation Received from Researcher:
Researcher Evaluation:

No. Documents Requested by Researcher: Team ordered 8

DOCUMENTS

Date Documents Ordered: 1-22-73 Date Received: 1-27-73 (partial)
Date Documents Sent to Researcher:
Researcher Evaluation: Documents so far too academic to be useful.
No. Hits:

HITS:

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM
COMPUTER SEARCH REPORT

IDENTIFICATION

Problem No. and Title: CRH-3 "Means to Minimize Venous Pooling"

RDC: RECON Search Title: See Terms

Search No. T638

INITIATION

Date Search Initiated: 12-21-72 Search Terms:
Venous pressure assist, pressure suits, muscle tone

TEAM EVALUATION

Date Search Results Received: 1- 8-73 No. Citations: 56
Date Evaluation Completed: =1-15-73 No. Relevant Citations: 0
Team Evaluation: Much info on physio-dynamics of problem, but no mechanical or other means provided.
Date Relevant Citations Sent to Researcher: 1-28-73 (sent for background information... still useful for what was provided)

RESEARCHER EVALUATION

Date Evaluation Received from Researcher:
Researcher Evaluation:

No. Documents Requested by Researcher:

DOCUMENTS

Date Documents Ordered: Date Received:
Date Documents Sent to Researcher:
Researcher Evaluation:
No. Hits:

HITS:

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM
COMPUTER SEARCH REPORT

IDENTIFICATION

Problem No. and Title: CRH-5 "Improved Clamp for Urine Collection Device"
RDC: RECON Search Title: See Terms
Search No. T637

INITIATION

Date Search Initiated: 12-21-72 Search Terms: Tubing clamp, plastic tubing valves, tubing pincher

TEAM EVALUATION

Date Search Results Received: 1-9-73 No. Citations: 16
Date Evaluation Completed: 1-22-73 No. Relevant Citations: 3
Team Evaluation: Citations are general. Possible relevancy if documents are ordered.
Date Relevant Citations Sent to Researcher: 1-22-73

RESEARCHER EVALUATION

Date Evaluation Received from Researcher: Team to order documents
Researcher Evaluation: and complete evaluation.
No. Documents Requested by Researcher: 3 ordered by team.

DOCUMENTS

Date Documents Ordered: 1-22-73 Date Received:
Date Documents Sent to Researcher:
Researcher Evaluation:
No. Hits:

HITS:

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM
COMPUTER SEARCH REPORT

IDENTIFICATION

Problem No. and Title: CRH-6 "Urine Collection Device for Incontinence in Female"
RDC: RECON Search Title: See Terms
Search No. T-0636

INITIATION

Date Search Initiated: 12-21-72 Search Terms:
Urine collection, urinary catheters, female astromauts

TEAM EVALUATION

Date Search Results Received: 1-4-73 No. Citations: 24
Date Evaluation Completed: 1-22-73 No. Relevant Citations: 1
Team Evaluation: The one relevant citation is a general resume that might be sufficient to develop an approach.
Date Relevant Citations Sent to Researcher: 1-22-73

RESEARCHER EVALUATION

Date Evaluation Received from Researcher: 1-22-73
Researcher Evaluation:

No. Documents Requested by Researcher: 1 ordered by team

DOCUMENTS

Date Documents Ordered: Date Received:
Date Documents Sent to Researcher:
Researcher Evaluation:
No. Hits:

HITS:

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM
COMPUTER SEARCH REPORT

IDENTIFICATION

Problem No. and Title: MDA-1 "Radiation Resistant Tilt Table for use in Radiotherapy"
RDC: RECON Search Title: See terms
Search No. T0641

INITIATION

Date Search Initiated: 12-21-72 Search Terms: radiotherapy equipment, radiation resistant metals and/or other structural composite materials

TEAM EVALUATION

Date Search Results Received: 1-10-73 No. Citations: 228
Date Evaluation Completed: 1-12-73 No. Relevant Citations: 7
Team Evaluation: Potential solution found manually in the interim, but supporting reference material might prove very useful to P. O.
Date Relevant Citations Sent to Researcher: We will wait until specific documents are received before sending to P. O.

RESEARCHER EVALUATION

Date Evaluation Received from Researcher:
Researcher Evaluation:
No. Documents Requested by Researcher: 7 ordered by team

DOCUMENTS

Date Documents Ordered: 1-15-73 Date Received:
Date Documents Sent to Researcher:
Researcher Evaluation:
No. Hits:

HITS:

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM
COMPUTER SEARCH REPORT

IDENTIFICATION

Problem No. and Title: SLU-1 "Elimination of Motion Artifact from EEG Leads in Pedestal Equipped Animals"
RDC: RECON Search Title:
Search No. T640

INITIATION

Date Search Initiated: 12-21-72 Search Terms: Electronic noises, coaxial cables, signal strengthening, motion artifacts

TEAM EVALUATION

Date Search Results Received: 1-9-73 No. Citations: 47
Date Evaluation Completed: 1-23-73 No. Relevant Citations: 2
Team Evaluation: helpful possibilities if 2 relevant documents are ordered.
Date Relevant Citations Sent to Researcher: 1-25-73

RESEARCHER EVALUATION

Date Evaluation Received from Researcher: 1-25-73
Researcher Evaluation:
No. Documents Requested by Researcher: 2 ordered by team

DOCUMENTS

Date Documents Ordered: Date Received:
Date Documents Sent to Researcher:
Researcher Evaluation:
No. Hits:

HITS:

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM
COMPUTER SEARCH REPORT

IDENTIFICATION

Problem No. and Title: UTM-39 "Multi-Channeled Hypothermia Blanket for Heart Surgery"
RDC: RECON Search Title: See Terms
Search No. T0635

Note: This was an additional search.

INITIATION

Date Search Initiated: 12-21-72 Search Terms:
Cardiac hypothermia, hypothermic cardiac arrest.

TEAM EVALUATION

Date Search Results Received: 1-4-73 No. Citations: 80
Date Evaluation Completed: No. Relevant Citations:
Team Evaluation: P.O. specifically requested this "re-search" and will perform the complete evaluation.
Date Relevant Citations Sent to Researcher: 1-18-73

RESEARCHER EVALUATION

Date Evaluation Received from Researcher:
Researcher Evaluation:
No. Documents Requested by Researcher:

DOCUMENTS

Date Documents Ordered: Date Received:
Date Documents Sent to Researcher:
Researcher Evaluation:
No. Hits:

HITS:

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

III. SEARCHES

D. SEARCHES EVALUATED BY THE INVESTIGATOR

On the following pages are copies of RDC Computer Search forms for the Biomedical Problems listed below for which documents have been reviewed by the problem originator during the period covered by this report.

Problem No.	Search No.	No. Citations	No. Relevant	No. Hits

None received during this report period.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

IV. APPLICATIONS ENGINEERING
A. NEW CANDIDATES

Applicable NASA Technology and Source	Problem Number	A.E. Start Date	Current Status
MSFC preamplifier design	SLU-1		Work can begin as soon as project is approved.
Existing NASA telemetry and flexible pressure switches	TTU-3		Work can begin as soon as project is approved.

BIOMEDICAL APPLICATIONS TEAM
SOUTHWEST RESEARCH INSTITUTE

DATA CONCERNING APPLICATIONS ENGINEERING NOMINATION

Problem # SLU-1

Title: Elimination of Motion Artifact From EEG Leads in Pedestal Equipped Animals

Description of technological requirement not commercially satisfied:

Problem Originator needs a device or method to eliminate motion artifacts picked up when using long leads to sensitive EEG leads attached to pedestal equipped animals. None of the commercially available coaxial or shielded leads have proven satisfactory.

Medical Significance: Researcher's efforts in evaluating the neuro-psychological effects of halucinogenic drugs would be greatly aided if these undesirable signals could be eliminated.

Contribution of Aerospace Technology: Addition of high gain, low voltage preamplifiers near the subject animals would eliminate the effects of motion in the cabling. MSFC preamplifier design will be used.

Resources Required:

Materials.....	$ 50.
Labor.....	$ 450.
Total	$ 500.

Delivery Schedule:

60 Days upon approval as AE candidate.

Does the problem originator appear to have sufficient expertise/understanding and/or technical support to successfully utilize the innovation?
Describe: The Problem Originator has been working with the animal/EEG measurement situation for many years. Development of a problem' solution would greatly enhance his results.

BIOMEDICAL APPLICATIONS TEAM
SOUTHWEST RESEARCH INSTITUTE

DATA CONCERNING APPLICATIONS ENGINEERING NOMINATION

Problem # TTU-3

Title: Rate Monitor for Self-Injurious Behavior

Description of technological requirement not commercially satisfied:

Problem Originator needs equipment which will allow him to determine the frequency of self-injurious acts on the part of mentally retarded children. Ability to automatically furnish reinforcement input to the patient upon occurance of an SIB is also desirable.

Medical Significance: This information will allow the investigators to determine the proper timing for, and the type of, reinforcements necessary to discourage the SIB.

Contribution of Aerospace Technology: NASA developed telemetry and flexible pressure switches will be used to produce a small, light-weight unit necessary for use with children.

Resources Required:

Materials.....	$ 250.
Labor.....	$ 1,000.
Total.....	$ 1,250.

Delivery Schedule:

60 Days upon approval as AE candidate.

Does the problem originator appear to have sufficient expertise/understanding and/or technical support to successfully utilize the innovation? Describe:

Problem Originator has complete staff of psychologists and technicians who deal with the problem daily and have the capability of understanding the device and performing satisfactory evaluation of same.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

IV. APPLICATIONS ENGINEERING
B. EFFORTS IN PROGRESS

Applicable NASA Technology and Source	Problem Number	A.E. Start Date	Current Status
NASA Tech Brief B69-10301	AEB-1		Work to be completed on 2 prototype units by 3-73.
NASA Tech Brief B72-10032	AEB-4		Work in progress at SwRI
NASA Tech Brief B68-10363	BVA-1		Electrode material sent to Problem Originator for evaluation. Awaiting response.
Response to disseminated problem statements from Naval Weapons Center.	OVA-2		Work to be initiated in near future in cooperation with Brooks Aerospace Medical Center, San Antonio.
NASA's advanced miniaturization technology at MSFC	SWC-2		MSFC expects completion of 3 units by 3-73.
Design developed by Husson and Nichols at Langley	TCD-4		Work in progress at Langley Research Center.
NASA Digital Thermometer (under contract NAS9-7852)applied to Skylab project	UAD-3		Awaiting further discussion and approval as AE candidate.
NASA microminiature biopotential transmitter developed at Ames	UAD-7		Work to be initiated on unit in near future.
IEEE Transactions on Biomedical	UAM-1		Awaiting new priority rating from NASA Headquarters.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

IV. APPLICATIONS ENGINEERING
C. PROJECTS INACTIVATED

Applicable NASA Technology and Source	Problem Number	A. E. Start Date	Current Status

None during this report period.

V. TECHNOLOGY APPLICATIONS

A. POTENTIAL TECHNOLOGY APPLICATIONS DEVELOPED

On the following pages are descriptions of the Biomedical Problems listed below which have attained the status of Potential Technology Applications during the period covered by this report:

Problem No.	Problem Title
AEB-1	Paper Money Identifier
AEB-2	Measurement of Physiologic Stress Parameters
AEB-4	Apparatus for Measuring Tactile Spatial Separation
GLM-44	Quickly Adjustable Crutch
GLM-45	Material for Water Stretcher
GLM-46	Adjustable Stretcher Cradle
MDA-1	Radiation Resistant Tilt Table for Use in Radiotherapy
TCB-18	Permanent Reflective Coating for Use on Canes for the Blind

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

POTENTIAL TECHNOLOGY APPLICATION REPORT

IDENTIFICATION

Problem No: AEB-1 Date of Preparation: 31 Jan 1973
Problem Title: Paper Money Identifier
Date Problem Accepted: 6 Jun 1973
Institution: Arkansas Enterprises for the Blind
Department: Training
Investigator: Elmo Knoch, Director of Training
BATeam Personnel: C. B. Dreyer and R. L. Wilbur
Estimated Time to Complete Application: 1 week

DISCUSSION OF PROBLEM AND REASON FOR POTENTIAL TECHNOLOGY APPLICATION CLASSIFICATION:

A significant number of the totally blind could be employed as cashiers in small vending operations if they had some reliable means of differentiating among the various denomininations of paper money, thus permitting them to (1) insure they were not being cheated by someone giving them a one dollar bill and claiming it was a five dollar bill, and (2) insure that they could, on their own, make proper change which involved paper money.

A search of NASA technology yielded Tech Brief 69-10301 "Semi-automatic Inspection of Microfilm Records." This approach utilized photoresistors and solid state electronics to provide a small inexpensive state-of-the-art package capable of discerning bill denomination. Preliminary blindfold tests with sighted individuals have resulted in (80-90%) reliability after approximately four hours of exposure. It is envisioned that a blind individual with better aural acuity and more motivation should be able to discern denominations with approximately 3 hours of training. Two prototype units are being fabricated for evaluation. For additional information, see the enclosed invention disclosure.

August 1969 Brief 69-10301

NASA TECH BRIEF

Semiautomatic Inspection of Microfilm Records

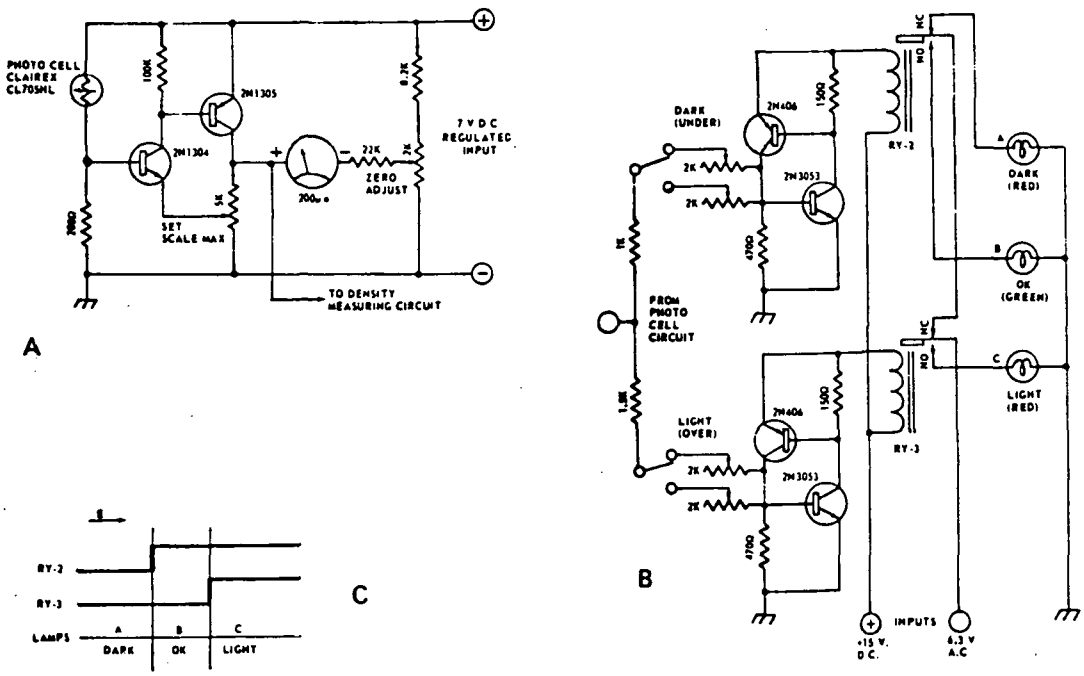


Fig. 1. MARK 1: Schematics of Photocell Circuit (A) and Density-Measuring Circuit (B), and Logic Diagram (C)

The problem:

Microfilm in a 35mm format is the industry standard for recording engineering data and other documentation for long-term storage and retrieval. Microfilm records used by the government are controlled by Specification MIL-STD-108. This specification prescribes image size and position tolerances, resolution requirements, and density restrictions.

Heretofore, microfilm inspection has been done manually, using an individual microscope, a densitometer, a light box, and hand-cranked reels. This method is not only time-consuming but it is sometimes of questionable quality since subjective judgment of the inspection personnel is a major factor.

The solution:

Inasmuch as deficiencies in microfilm quality are undetected by this nonuniformity of inspection apparatus it follows that these deficiencies can be alleviated by providing a semiautomatic-type inspection machine for this purpose. Accordingly, two working models were designed and constructed by the support contractor to the MSFC Management Services Office. Improvements in reliability and ease of operation

(continued overleaf)

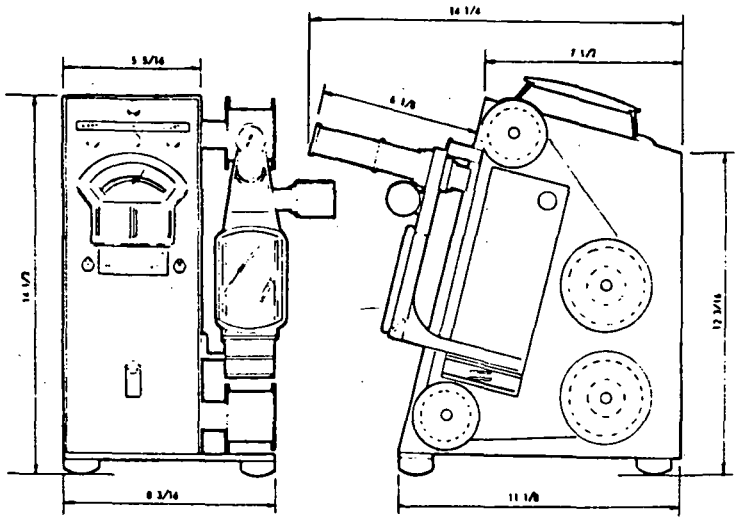


Fig. 2. Outlines of MARK II; Dimensions are in inches.

were made in the second prototype identified as MARK II.

How it's done:

The microfilm inspector utilizes motor-driven film reels with a means for precisely positioning the microfilm image for inspection. Film density is measured by means of a photoelectric cell and solid-state electronic circuit. Over and under tolerances are preset according to specification. As the film is inspected, go-no-go indicator lights advise the operator of the film status. In addition to the lights, a densitometer provides specific values for film density. These are recorded to back up the film-inspection report.

Resolution of the photographic image on the film is determined by a microscope which is an integral part of the machine. Image size and position are also determined by a built-in optical device.

Principal advantages of the microfilm inspector are:

1. Uniformity of inspection method.
2. Increased speed of inspection.
3. Improved quality through elimination of scratches, finger marks, etc.

Note:

Documentation is available from:
Clearinghouse for Federal Scientific and Technical Information
Springfield, Virginia 22151
Price $3.00
Reference: TSP69-10301

Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to NASA, Code GP, Washington, D.C. 20546

Source: E. L. Klein of
RCA Service Company
under contract to
Marshall Space Flight Center
(MFS-20240)

RECORD OF INVENTION

44

Docket No.

Date Rec'd

1. Title: PAPER MONEY IDENTIFIER

2. Object: To design, develop, and fabricate a prototype paper money identifier for the visually handicapped. Output requirements necessitate aural discrimination by the blind individual.

3. Date first constructed or formulated (if applicable): 22 January 1973

4. Other references of record (if any):

5. I - ~~We~~, the undersigned, certify that I - ~~We~~ first conceived the within invention on 26 Dec. 1972 and that it is fully described in the attached disclosure on pages numbered consecutively 1 thru 3

Signature in full Charles Benjamin Draper Date 31 Jan 73

Signature in full _____ Date _____

Signature in full _____ Date _____

6. We, the undersigned, certify that the invention described in the attached disclosure was explained to us on 23 Jan. 1973 and that we understand the same.

Signature in full Robert Leighton Wilbur Date 31 Jan 73

Signature in full Jean Ware Carter Date 31 Jan 73

For Department Director Only

7. The within invention was - not conceived as the result of work on a sponsored research project. Project No. 13-2538 Contract No. NASW-1867
Sponsor
Technology Utilization Division, NASA, Washington, D. C.

8. Summary recommendation to Patent Advisory Committee: Reference to NASA Form 1162, 6 June 1966, this invention becomes the property of the ~~U.S. Government. This disclosure is for information and documentation~~ purposes.

_____ Date 1 Feb. 73
Department Director

Form OP - 2
Rev. 7/66

(See Instructions on Reverse)

INVENTION DISCLOSURE DESCRIPTION

Page No._____ of _____

PAPER MONEY IDENTIFIER

An electronic device has been invented which allows a sight deficient person to determine the denomination of any piece of paper currency handed him. This device consists of an optical scanner, a voltage controlled oscillator, and associated audio circuitry. When using the device, the blind operator is presented with a varying audio tone pattern as he sweeps the optical scanner over the surface of the bill in question. Once the tone patterns generated by the various denominations of paper currency are learned, the operator will be able to determine the value of any piece of paper money handed him.

The optical scanner consists of a light source and a sensitive phototransistor suitably housed to be easily held in the hand. The phototransistor is connected as part of a voltage divider network which controls the voltage input to the VCO. As the reflected light to the phototransistor varies, the voltage presented to the VCO is thus modulated to generate the identifying tone pattern. This pattern is presented either through a speaker or an ear phone at the option of the operator.

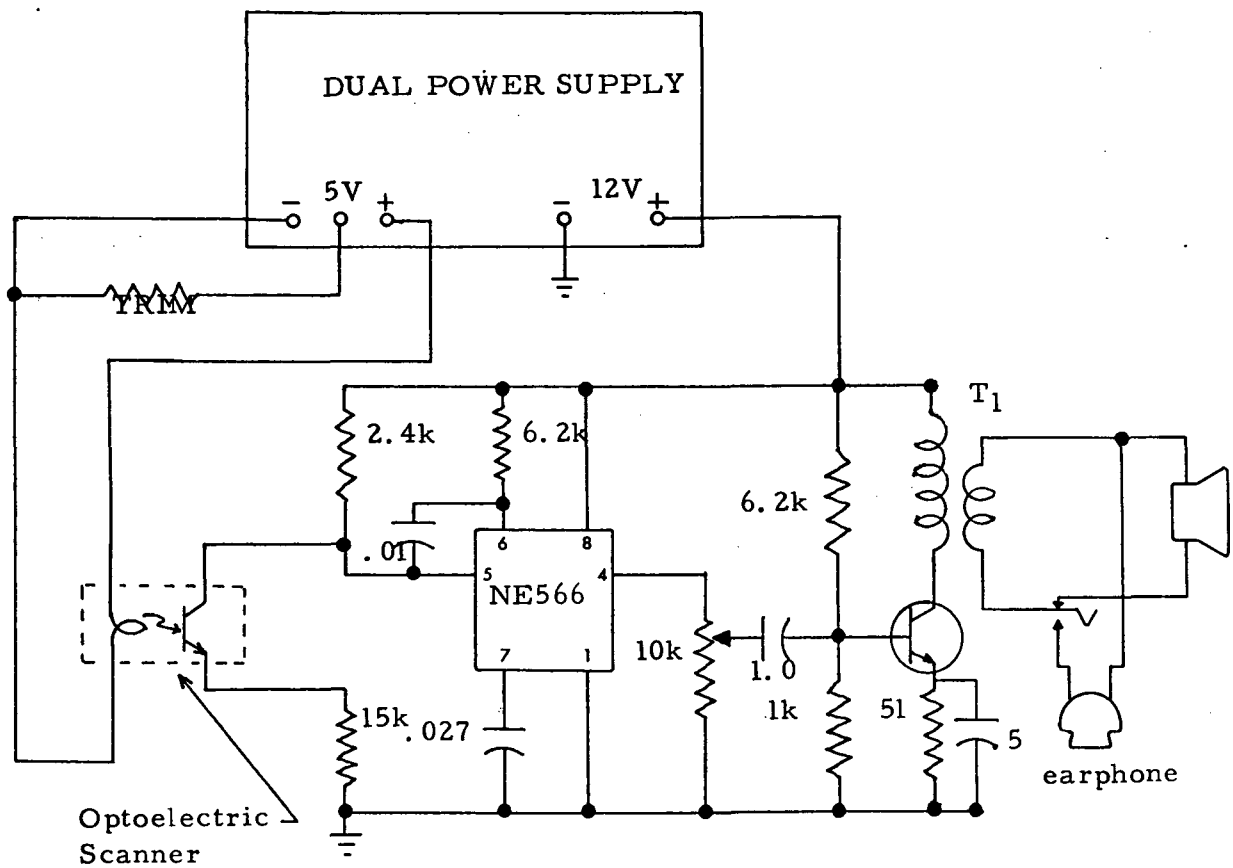
INVENTORS: -

Charles Benjamin Wooyer	31 Jan 73	WITNESSES: -	
Signature	Date		
		Robert Leighton Wilbur	31 JAN 73
Signature	Date	Signature	Date
		Jean Mary Carter	31 Jan 73
Signature	Date	Signature	Date

Form OP-2A
Rev. 7/66.

INVENTION DISCLOSURE DESCRIPTION

Page No._____ of _____



INVENTORS: -

Charles Benjamin Draper — 31 Jan 73
Signature — Date

WITNESSES: -

Robert Leighton Wilbur — 31 JAN 73
Signature — Date

Joan Mary Carter — 31 JAN 73
Signature — Date

Signature — Date

Signature — Date

Form OP-2A
Rev. 7/66

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

POTENTIAL TECHNOLOGY APPLICATION REPORT

IDENTIFICATION

Problem No: AEB-2 Date of Preparation: 31 Jan 1973
Problem Title: Measurement of Physiologic Stress Parameters
Date Problem Accepted: 15 Jun 1972
Institution: Arkansas Enterprises for the Blind
Department: Training
Investigator: Elmo Knoch, Director of Training
BATeam Personnel: R. L. Wilbur
Estimated Time to Complete Application: 15 Days

DISCUSSION OF PROBLEM AND REASON FOR POTENTIAL TECHNOLOGY APPLICATION CLASSIFICATION:

Blind trainees sometimes find exposure to new situations and tasks to be very stressful. Presently, it is difficult for the instructor to evaluate degree of stress to which the trainee is being exposed. Obtaining an objective measure of much stress is important both in terms of (1) prediction of success once the trainee has been placed vocationally and (2) in adjusting the training program so as to make it minimally stressful and descriptive.

A wireless method of monitoring ECG is needed to prevent undue encumberance. The solution included the use of the cardiotachometer described in the Technical Support package included in the report. Also included is the biopotential transmitter developed at Ames described in Tech Brief 64-10171. The demodulator developed at SwRI is included in the cardiotachometer package. Transmitter range is approximately 200 feet inside buildings and should be sufficient for most rehabilitative work. A single unit will be provided for evaluation by the Problem Originator.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

POTENTIAL TECHNOLOGY APPLICATION REPORT

IDENTIFICATION

Problem No: AEB-4 Date of Preparation: 31 Jan 1973
Problem Title: Apparatus for Measuring Tactile Spatial Separation
Date Problem Accepted: 14 Sept 1972
Institution: Arkansas Enterprises for the Blind
Department: Educational Services
Investigator: Billie Elder, Supervisor
BATeam Personnel: Sam McFarland and John Sigmon
Estimated Time to Complete Application: 30 Days

DISCUSSION OF PROBLEM AND REASON FOR POTENTIAL TECHNOLOGY APPLICATION CLASSIFICATION:

Determination of various diseases, examinations for treatment of nervous disorders, and evaluation of finger-touch sensitivity for blind persons have all been related to aethesia, or skin sensitivity to pain. Measurement or detection of cutaneous perception has not heretofore been quantified, because of the lack of an instrument capable of consistently reproducing measurements.

Examiners at Arkansas Enterprises for the Blind, Inc., Little Rock, have expressed the need for measuring sensory acuity in the fingertips as a means of predicting the ability to learn to read Braille.

The SwRI Biomedical Applications Team has located an aethesiometer device from Tech Brief B72-10032 (developed under contract to NASA by researchers at General Electric.) Negotiations with the exclusive licensee have yielded up-to-date drawings of the device. One or more prototypes will be fabricated at SwRI for evaluation by personnel of Arkansas Enterprises for the Blind.

The SwRI Biomedical Applications Team wishes to thank Manned Spacecraft Center, General Electric, and Rowan Products for making the information available to the medical community.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

POTENTIAL TECHNOLOGY APPLICATION REPORT

IDENTIFICATION

Problem No: GLM-44 Date of Preparation: 31-Jan 1973
Problem Title: Quickly Adjustable Crutch
Date Problem Accepted: 24 Aug 1972
Institution: University of Texas Medical Branch, Galveston, Texas
Department: Physical Therapy
Investigator: Miss Mickie Spence, P. T.
BATeam Personnel: Sam McFarland
Estimated Time to Complete Application: 30 Days

DISCUSSION OF PROBLEM AND REASON FOR POTENTIAL TECHNOLOGY APPLICATION CLASSIFICATION:

Many patients of rehabilitation facilities need to be fitted for crutches or walkers at their first visit. Though it seems a minor activity in rehabilitation, it has been demonstrated that as much as 3 to 4 man-hours of therapist time daily can be absorbed in this one simple function, because standard appliances commonly are assembled with screws and wing nuts, requiring considerable manipulation for adjustments.

Directors of the Physical Therapy Clinic at John Sealy Hospital, Galveston, Texas, demonstrated the problem to SwRI BATeam personnel. Since cost impact was expressed to be important, it was decided, after discussions at the hospital, that a replacement for the screws and wing nuts would offer the most suitable first solution.

It was soon determined that a pin-type fastener, used commonly throughout the aerospace network would help to solve the problem. The pin in question is a ball-detent type having a fold-over lock ring. A sample pin was demonstrated at Galveston and the problem originator was enthusiastic about its ease of use. The pins are inexpensive and allow use of standard appliances without modification.

A representative quantity of the pins are being acquired for the problem originator to use and evaluate.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

POTENTIAL TECHNOLOGY APPLICATION REPORT

IDENTIFICATION

Problem No: GLM-45 Date of Preparation: 31 Jan 1973
Problem Title: Material for Water Stretcher
Date Problem Accepted: 24 Aug 1972
Institution: University of Texas Medical Branch, Galveston, Texas
Department: Physical Therapy
Investigator: Miss Mickie Spence, P. T.
BATeam Personnel: Sam McFarland, John Sigmon
Estimated Time to Complete Application: 30 Days

DISCUSSION OF PROBLEM AND REASON FOR POTENTIAL TECHNOLOGY APPLICATION CLASSIFICATION:

Burn patients are transported to the hydrotherapy bath on a stretcher which is immersed, with the patient, in the bath. The stretcher is a tubular steel rectangle, serving as a support for a rubberized canvas material which is laced to the frame like the mat of a trampoline. This existing configuration is abrasive, damaging, and painful to the patient. A strong, smooth material is desired, but must also have the capability of being sewed and readily sterilized.

The SwRI Biomedical Applications Team, working through its on-site representative at Manned Spacecraft Center, has identified two materials which offer potential solutions. One of these is a rubber-impregnated nylon used for astronaut life-jackets; the other is a teflon-coated nylon used in astronaut space suits. Samples of each are being acquired for fabrication to an envelope configuration which can be slipped over the stretcher frame. The prototype covers will then be evaluated by the Physical Therapy Department at John Sealy Hospital, Galveston, where the problem originated.

The SwRI Biomedical Applications Team wishes to express its appreciation to personnel of the Manned Spacecraft Center for their willing cooperation in this effort.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

POTENTIAL TECHNOLOGY APPLICATION REPORT

IDENTIFICATION

Problem No: GLM-46 Date of Preparation: 31 Jan 1973
Problem Title: Adjustable Stretcher Cradle
Date Problem Accepted: 31 Aug 1972
Institution: University of Texas Medical Branch, Galveston, Texas
Department: Physical Therapy
Investigator: Miss Mickie Spence, P. T.
BATeam Personnel: Sam McFarland
Estimated Time to Complete Application: 30 Days

DISCUSSION OF PROBLEM AND REASON FOR POTENTIAL TECHNOLOGY APPLICATION CLASSIFICATION:

Burn patients are highly susceptible to infection through the skin. During transportation to and from treatment wards, the patient is enclosed in a canopy of sheets that cover his stretcher, supported by a cradle. The present cradle, though collapsible for easy storage, requires two people to install and will not accomodate variations such as large patients, traction devices, or splints. There is then the need for adjustment of the volume enclosed by the cradle.

The SwRI Biomedical Applications Team has identified a litter cradle developed by the School of Aerospace Medicine at Brooks Air Force Base, San Antonio. A copy of the cradle was demonstrated to the Problem Originator at John Sealy Hospital, Galveston, where it was shown to offer solution possibilities. The SwRI team has thus agreed to modify the SAM design to produce one or two prototypes for evaluation at Galveston. The design is quite simple, easy to manipulate, and may be used in varying sizes, as needed.

The SwRI team wishes to thank the School of Aerospace Medicine, Aeromedical Evacuation Systems Group, for providing the basis for solving this problem.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

POTENTIAL TECHNOLOGY APPLICATION REPORT

IDENTIFICATION

Problem No: MDA-1 Date of Preparation: 31 Jan 1973
Problem Title: Radiation Resistant Tilt Table for Use in Radiotherapy Date Problem Accepted: 14 Aug 1972
Institution: M. D. Anderson Hospital, Houston, Texas
Department: Radiotherapy
Investigator: David H. Hussey, M. D.
BATeam Personnel: R. L. Wilbur, Jean Carter
Estimated Time to Complete Application: 60 Days

DISCUSSION OF PROBLEM AND REASON FOR POTENTIAL TECHNOLOGY APPLICATION CLASSIFICATION:

Radiologists in M. D. Anderson Hospital, Houston, are in the developmental stages of massive tumor treatment by fast neutrons generated by bombarding Berrylium with Deuteron. They plan to use the Cyclotron at Texas A&M. Present problems involve finding a suitable material to fabricate the patient tilt table. This material should be able to withstand the bombardment of thermal and epithermal neutrons without accumulating a great deal of radio activity.

A manual search of available NASA literature gave reference to a newer class of polymers called "pyrrones." NASA SP-5075, "Aerospace Related Technology for Industry," from a conference held at Langley Research Center, includes an article by Warren C. Kelliher (see attached pages) discussing the forms of pyrrones and their outstanding radiation resistance.

The Problem Originator is enthusiastic about the material and its properties. The SwRI Biomedical Applications Team is presently awaiting receipt of material samples for evaluation in Houston.

NASA SP-5075

AEROSPACE RELATED TECHNOLOGY FOR INDUSTRY

A conference held at
LANGLEY RESEARCH CENTER
Hampton, Virginia
May 22, 1969

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

24. PROPERTIES AND POTENTIAL APPLICATIONS OF A NEW HIGH-TEMPERATURE POLYMER, PYRRONES

By Warren C. Kelliher

Langley Research Center

INTRODUCTION

The pyrrones are a new class of polymers that have been developed at the Langley Research Center for high-temperature environments. The polymer is a thermosetting-type resin resulting from the reaction of an aromatic tetraamine with an aromatic dianhydride. (See fig. 1.) The two monomers initially react to form an intermediary stage having a nylon type of structure. At this stage the polymer is tractable and forms the basis for fabricating the polymers into useful end products. By use of a thermal-curing process, the polymer loses water, forms initially a polybenzimidazole (PBI) or polyimide (PI) structure, and then fully cyclizes to the pyrrone structure. The PBI and PI are commercially available high-temperature resins and have a step-ladder structure as schematically shown in figure 1. The pyrrones, however, being fully cyclized have a full-ladder type structure, are more rigid, and have different properties than the PI and PBI resins.

The two available forms of the intermediate stage of the polymer are shown in figure 2. The solution form can be obtained by using a variety of solvents and is generally used for producing films and coatings. The solution or varnish, as it is sometimes called, is suitable also for making laminates, since a solids content of 35 percent in the varnish can be obtained. The powder is a fine, free-flowing material used for the production of foams and moldings.

DISCUSSION

Some of the forms that have been fabricated from the pyrrone intermediate stage are shown in figure 3 and are:

(1) Films – The films have high strength, little elongation, and reflect the rigid nature of the pyrrone polymers. The investigation of the properties of the films has shown a potential application as a membrane or a separator in electrolysis systems.

(2) Coatings – Solutions of the high-molecular-weight pyrrone intermediate stage have a natural film-forming tendency and also have good adhesive properties. As a result, excellent coherent coatings on a variety of substrates can be obtained. The thermal and

chemical stability of the pyrrones suggest potential application of the coatings where high-temperature corrosion resistance is required.

(3) Laminates – Much of the applied research on pyrrone resins has been in the area of fabricating and testing of laminates for high-temperature structural applications. The high rigidity of the pyrrone resin structure results in laminates having high flexural strengths, and the good adhesive properties of the intermediary solution stage results in laminates with high interlaminar shear strengths. At the present time, the long-term high-temperature properties of the pyrrone laminates are being investigated in combination with different reinforcing agents.

(4) Foams – Because of the volatiles given off during the thermal curing process, the pyrrones have a natural tendency to foam. This property presents some difficulty in producing quality laminates and moldings. Because of the high-temperature stability and high strength of these foams, they are currently being evaluated for use as ablative materials and as a structural core material. Foams with densities as low as 15 lb/ft^3 that possess good mechanical strength properties have been obtained.

(5) Moldings – Unfilled moldings have been produced at the Langley Research Center and are being used as a means to evaluate the properties of the cured resin system. An investigation of filled moldings has just begun and good results have been obtained with 50 percent loading levels of aluminum, mica, molybdenum disulfide, and graphite in pyrrone.

For comparison with other polymers, the more significant strength properties of different fabricated forms of pyrrone resins are presented in figure 4:

(1) Films: For 1 mil thickness film – high tensile strengths, 20 000 psi; low elongation, 6 percent.

(2) Laminates: For 12 ply, glass-reinforced laminates – high flexural strength, 90 000 psi; high modulus strength, 5×10^6 psi; good horizontal shear strength, 5000 psi. When tested at 600° F, retains 80 percent of room-temperature strengths.

(3) Foams: For unreinforced 30 lb/ft^3 density foams – high compressive strength, 2000 psi; high modulus strength, 1.3×10^5 psi.

(4) Moldings: For unreinforced moldings – high flexural strength, 18 000 psi. When tested at 600° F after 100 hours at 600° F, they had 15 000 psi flexural strength and 3000 psi flexural strength at 1000° F.

The general properties of the pyrrone polymers are:

(1) Nonflammable – It can be heated to incandescence without flammable combustion

(2) Outstanding radiation resistance – Although most polymers suffer degradation after 5000 Mrads of radiation, the pyrrone were subjected to 50 000 Mrads of radiation and had no detectable degradation of properties

(3) High-temperature stability – Pyrrones have long-term stability to at least 500° F and potentially to 600° F; short-term stability to 1000° F

(4) Good adhesion, coatability, and corrosion resistance – Pyrrones have excellent potential as high-temperature corrosion-resistance coatings; 1000 hours at 150° F in 40 percent sulfuric acid and potassium hydroxide had little effect on the resin

(5) Easy to machine – Because of rigid nature of the polymer, it is very easy to perform normal milling, cutting, and sanding operations on the cured resin.

CONCLUDING REMARKS

It must be emphasized that the pyrrones are a new class or family of polymers and these polymers have different chemical and mechanical properties depending on the starting monomeric materials. At Langley Research Center the polymers are being developed and their properties are being investigated from the standpoint of space and aeronautical utilization. The polymer does, however, have some very interesting and useful properties that could have commercial applications. Its development for these purposes and potential usage is left to the initiative of private enterprise. The polymer is available in research quantities from the Langley Research Center and from two contractors, Hughes Aircraft and Avco Corp., who are assisting in the optimization of the mechanical properties of the polymer. Additional details on these polymers can be obtained from the Langley Research Center.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

POTENTIAL TECHNOLOGY APPLICATION REPORT

IDENTIFICATION

Problem No: TCB-18 Date of Preparation: 31 Jan 1973
Problem Title: Permanent Reflective Coating for Use on Canes for the Blind Date Problem Accepted: 25 Apr 1972
Institution: Criss Cole Rehabilitation Center, Austin, Texas
Department: Research
Investigator: Jim Caylor
BATeam Personnel: Jean Carter
Estimated Time to Complete Application: 60 Days

DISCUSSION OF PROBLEM AND REASON FOR POTENTIAL TECHNOLOGY APPLICATION CLASSIFICATION:

The Problem Originators needed technological method and material to provide a permanent and scratchless reflective coating for aluminum canes. The present material used is a reflective tape. The reflective quality is excellent, but is easily scratched and becomes quite unattractive when the tape begins to peel off in a matter of weeks. Thus the need was established for material that would protect or replace the tape and still not add too much weight to the cane so as to disorient the sensitivity of the user.

A search of the NASA data bank on various coating materials yielded Tech Brief B72-10337 "Nonflammable Potting, Encapsulating and/or Conformal Coating Compound." Although the compound was originally developed for its fire retardant and electrical component encapsulation uses, the formula contained a 325 glass mesh bead.

Working on the idea of the reflective quality of these beads, the technical support package on the formula was obtained and a much larger bead, 40 to 100 mesh was substituted and the curing process was modified. Preliminary tests on two canes coated in this manner have been most encouraging. The Problem Originator reports that the weight of the canes has not been affected to any appreciative degree, that the brilliant white coating is cosmetically pleasing, that in the five weeks they have been used so far no scratching has occured, that the reflectivity has not been affected by hand perspiration, and that the beads are remaining rigidly in place.

More prototype canes are being coated and distributed for extensive wearability testing. The Problem Originator is also pleased that this process is cost-effective and easy to apply and that existing canes can be utilized.

NASA TECH BRIEF
Manned Spacecraft Center

Nonflammable Potting, Encapsulating and/or Conformal Coating Compound

A polymer material formed from dimethylpolysiloxane, ammonium phosphate, and ground glass, provides a nonflammable potting, encapsulating, or conformal coating compound. It is nonflammable in an air environment and self-extinguishing in an atmosphere of 60 percent oxygen and 40 percent nitrogen. The table gives the formulation of the material.

Ingredient	Percentage by Weight
Dimethylpolysiloxane Resin	42.56%
Ammonium Phosphate, Monobasic	31.91%
Glass, 325 Mesh	21.28%
Dimethylpolysiloxane Curing Agent	4.25%

The ammonium phosphate appears to inhibit or retard combustion by interfering with the free radical chain reactions. In addition, gas emitted by the hot ammonium phosphate causes intumescence of the dimethylpolysiloxane and creates an insulating gaseous layer. The glass, which melts at low temperatures, reduces the rate of heat transfer within the material.

This material may have applications for reducing industrial fire hazards. Also, results of preliminary dielectric property measurements indicate a potential use in electrical component encapsulation.

This material should interest the aircraft industry, machinery manufacturers, the automotive industry, and manufacturers of encapsulating, potting, and conformal coating polymers.

Note:

Requests for further information may be directed to:
Technology Utilization Officer
Manned Spacecraft Center
Code JM7
Houston, Texas 77058
Reference: TSP72-10337

Patent status:

No patent action is contemplated by NASA.

Source: H. F. Kline and Fredrick Dawn
Manned Spacecraft Center
(MSC-13499)

Category 04

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

V. TECHNOLOGY APPLICATIONS
B. TECHNOLOGY APPLICATIONS CLAIMED

Below is a list of Biomedical Technology Applications claimed during the period covered by this report. On the following pages are Technology Applications Reports for those claimed.

Problem No.	Problem Title
AEB-2 and TVA-2	Portable Heart Rate Indicator for Active Patients (Additional Documentation)

TECHNICAL SUPPORT PACKAGE FOR

PORTABLE BEAT TO BEAT CARDIOTACHOMETER

NASA BIOMEDICAL APPLICATIONS TEAM

SOUTHWEST RESEARCH INSTITUTE

Problems TVA-2 and AEB-2

January 16, 1973

PORTABLE BEAT-TO-BEAT CARDIOTACHOMETER

ABSTRACT

Monitoring heart rate on convalescing heart attack patients has been routine for some time. However, most therapists manually record pulse rate before exercise and again after exercise at prescribed intervals. There has been and is a definite need for a small, inexpensive beat-to-beat cardiotachometer that will provide continuous heart rate information on exercising individuals with a concomitant time saving for therapists.

A portable unit was designed and fabricated with discrete components fashioned after a more sophisticated NASA unit which meets most of the needs of the problem originator. Those requirements, not filled would double the cost destroying the most desirable features of the instrument. The instrument will accept either electrodes or auxillary inputs and provides both meter and recorder outputs. The AEB-2 model incorporates telemetry features at a small increase in cost.

Brief Technical Description of the

Portable Beat-to-Beat Cardiotachometer

This instrument has the ability to monitor ECG biopotentials either directly via electrodes or from auxillary devices such as tape recorders, telemetry systems, and chart recorders. The entire system fits nicely into a small case with a shoulder strap for ambulatory use. Further miniaturization is possible but for cost effective design, the prototypes were not reduced to a hand-held unit.

The instrument includes three subsystems depending upon design requirements:

1. Cardiotachometer
2. Transmitter
3. Demodulator

For the telemetry requirement a standard broadcast FM receiver is the only additional item required.

The cardiotachometer receives ECG biopotential signals, recognizes the R wave and squares it. A FET and reed relay comprise a sample and hold circuit which drives the meter and the output with a staircase signal.

The telemetry option provides a clinical ECG at point A on the schematic.

TABLE OF CONTENTS

LIST OF FIGURES

I. Introduction

The portable cardiotachometer was developed for therapists working with cardiovascular patients when it became obvious to both the therapists and the BATeam that commercially available devices were not available regardless of advertising claims.

Since rehabilitation money is scarce and the need great, an inexpensive system was definitely most desirable. While most problem originators desired high accuracy, high-low reading meters and hand-held devices, these features so increased the cost so as to diminish the effectiveness of an inexpensive device.

After careful analysis of five years of problems relating to cardiotachometer oriented solutions, the following design goals were chosen:

1) Heart rate must be measured accurately on both a meter and auxillary output.

2) Instrument is portable and durable.

3) Instrument should have a calibration range of 50-140 beats per minute (BPM).

4) Instruments should be versatile in type of inputs, electrodes, recorder, telemetry, etc.

Final design criteria included technology from MSFC on beat to beat cardiotachometers, ARC on biotelemetry, and SwRI state-of-the-art engineering techniques in combining all technology into an instrument providing reliable heart rate information.

A convenient size was chosen to package the device both for the standard unit and the telemetry unit primarily to remain cost effective. If unique applications arise, the device can easily be miniaturized into a hand-held device.

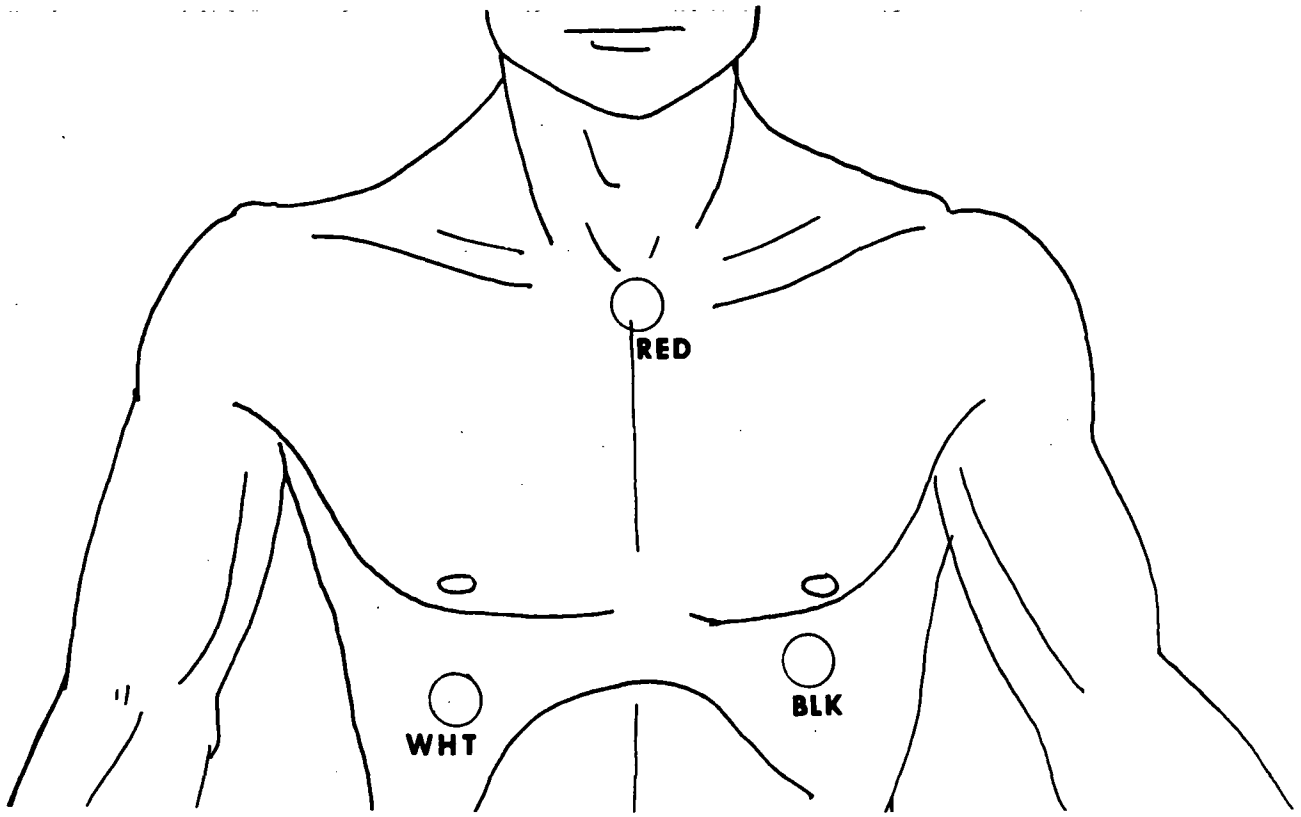


Figure 1(A) Electrode Placement (Hard Wire)

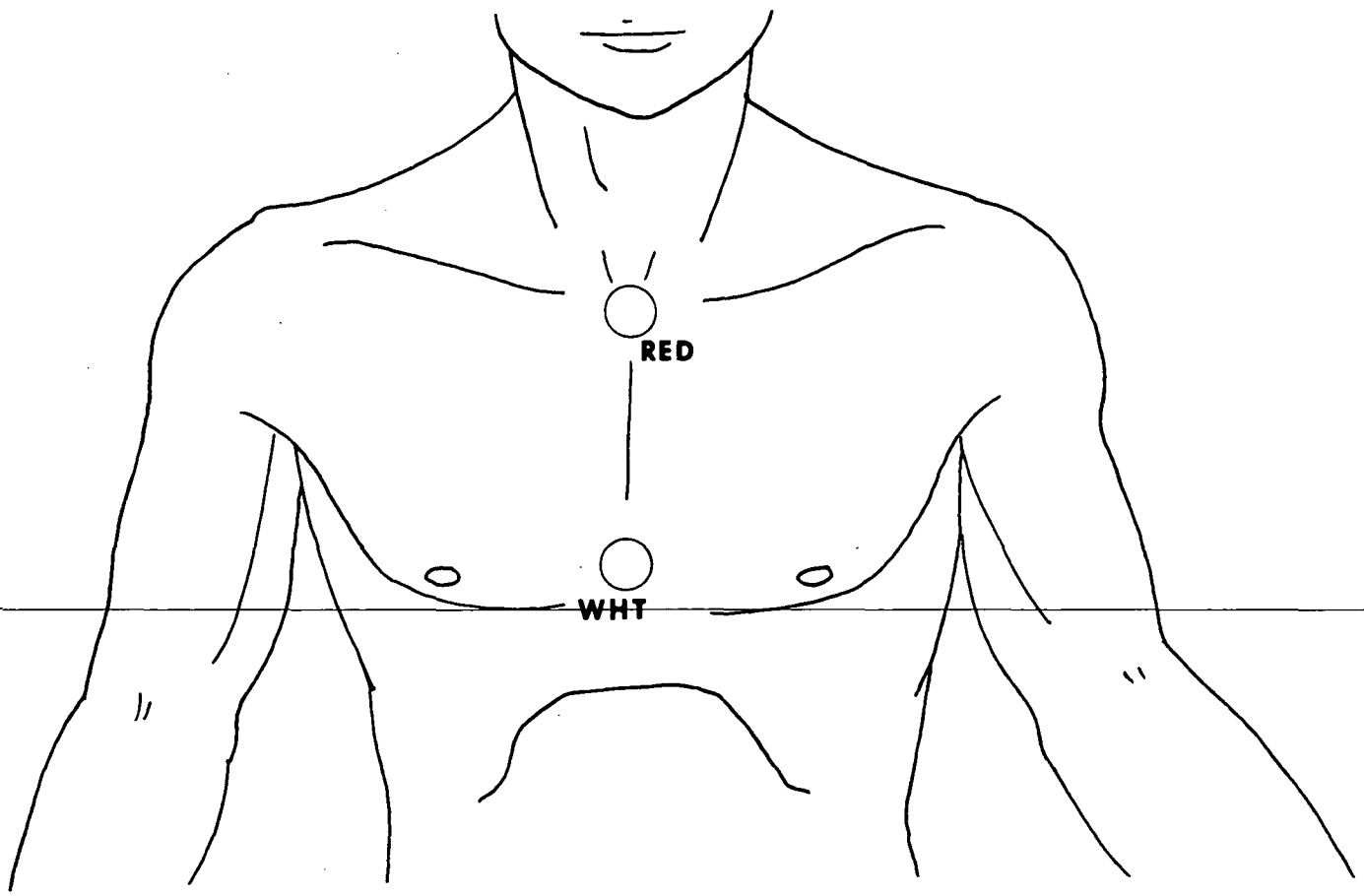


Figure 1(B) Electrode Placement (Telemetry)

II. Operating Instructions

Acquiring heart rate information from electrodes is accomplished by connecting the electrodes to the patients as shown in Figure 1(A). Lead color is connected to the corresponding coded input jacks on the cardiotachometer. The selector switch is switched toward the electrode jacks and the unit is turned on. The instrument is now ready for use.

If heart rate information is being analyzed from a tape recorder or some other piece of auxillary equipment, the selector switch is switched toward the pulse position and a cable is attached to the pulse in jack.

Monitoring by telemetry is accomplished by placing the electrodes on the patient as shown in Figure 1(B) and the corresponding color coded wires connected to the transmitter. An FM standard broadcast receiver is tuned until a clear Heart Rate signal is acquired. The selector switch is switched to Pulse and a cable is connected from the earphone jack on the FM radio to the radio input on the cardiotachometer. The unit is now ready for use.

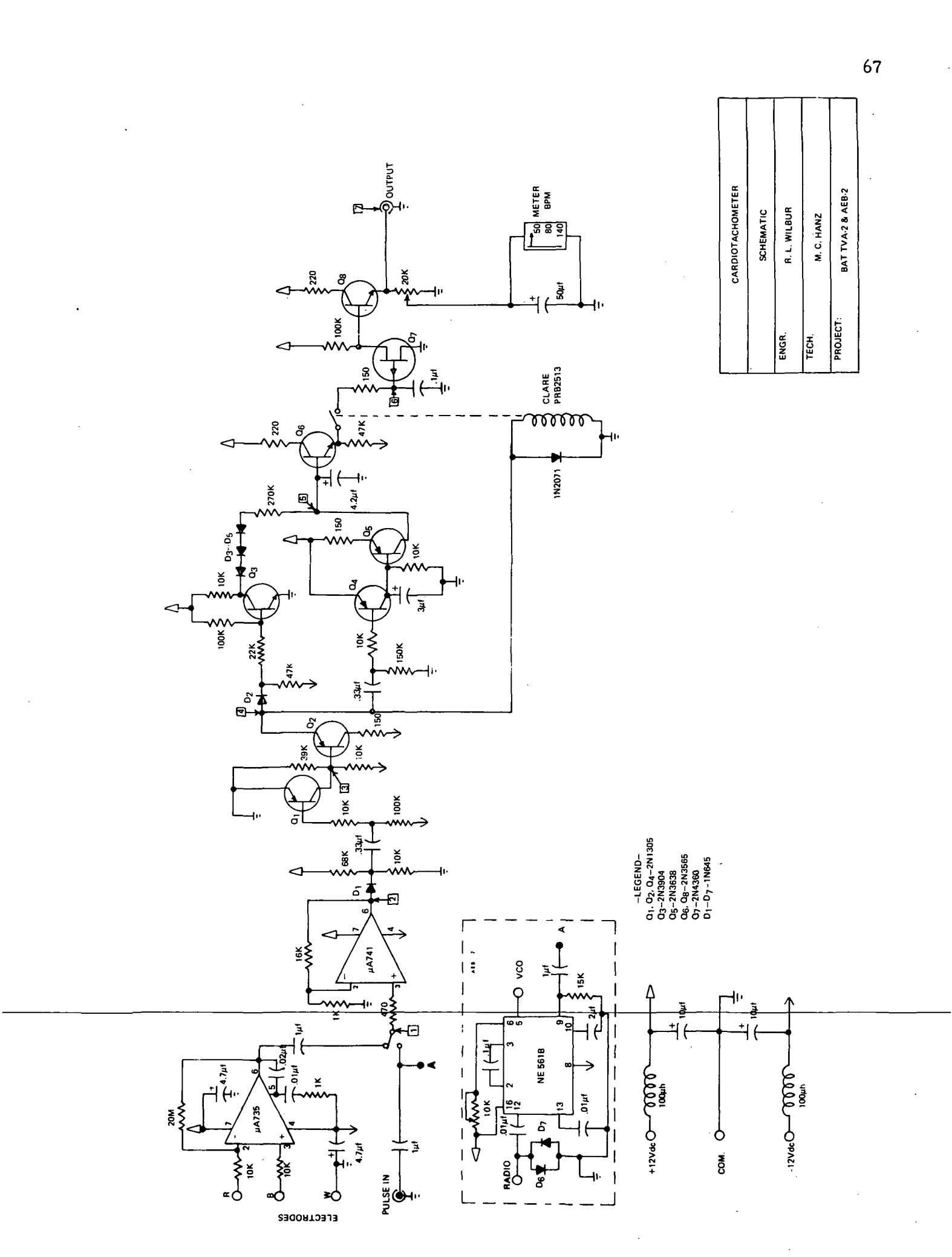
If visual readout other than the meter is desired, a cable may be connected from the OUTPUT jack to a suitable presentation device such as a strip chart recorder or oscilloscope.

III. Technical Discussion

This cardiotachometer, a low cost solid state instrument, provides an output voltage proportional to the instantaneous frequency of ECG pulses in. Output linearity is $\pm$ 50% from 30 to 150 beats per minute with either hard wire or telemetry input. The meter is calibrated from 40-140 beats per minute.

The monitoring of heartrate on a beat-to-beat basis is facilitated by converting pulse interval to a voltage by means of an exponential waveform generator.

Operation of the cardiotachometer can best be described with the aid of the schematic, Figure 2. Depending on the input, the ECG is amplified by either the micropower input amplifier, the signal conditioner


CARDIOTACHOMETER
SCHEMATIC
ENGR. R. L. WILBUR
TECH. M. C. HANZ
PROJECT: BAT TVA-2 & AEB-2
OUTPUT
METER BPM
50 80 140
50µf
220
20K
100K
150
1µf
CLARE PRB2513
1N2071
47K
4.2µf
270K
D3-D5
10K
3µf
150K
.33µf
39K
68K
16K
µA741
1K
470
VCO
15K
2µf
NE 561B
.1µf
.01µf
RADIO
D6
D7
+12Vdc
COM.
-12Vdc
100µh
10µf
-LEGEND-
Q1, Q2, Q4-2N1305
Q3-2N3904
Q5-2N3638
Q6, Q8-2N3565
Q7-2N4360
D1-D7-1N645
µA735
20M
4.7µf
.02µf
ELECTRODES
R
B
W
PULSE IN

amplifier (A 741) or the demodulator (NE561B). Waveform 2 is indicative of the positive pulse needed to drive the cardiotachometer section. Transistors Q_1 and Q_2 comprise a simple monostable multivibrator. The positive input pulse passed through D_1 turns Q_1 off, driving the emitter of Q_2 to approximately -9 volts. This energizes the relay so that the 0.1 microfarad capacitor in the gate circuit of the FET is charged to approximately the same voltage as that of the 4.2 microfarad capacitor by means of emitter follower Q_6. During this sampling interval Q_3 is off preventing the 4.2 microfarad capacitor from discharging through the 270 k ohm resistor. During this sampling interval, the .33 microfarad capacitor in the base of Q_1 charges negatively turning Q_1 on. The positive transition on the emitter of Q_2 drives Q_4 off and Q_5 on. Q_4 and Q_5 is a monostable multivibrator like Q_1 and Q_2. As Q_5 turns on, the 4.2 microfarad capacitor charges rapidly to approximately +11 volts. The .33 microfarad capacitor in the base of Q4 charges negatively turning Q_5 off so that the 4.2 microfarad capacitor may discharge through the 270 k ohm resistor.

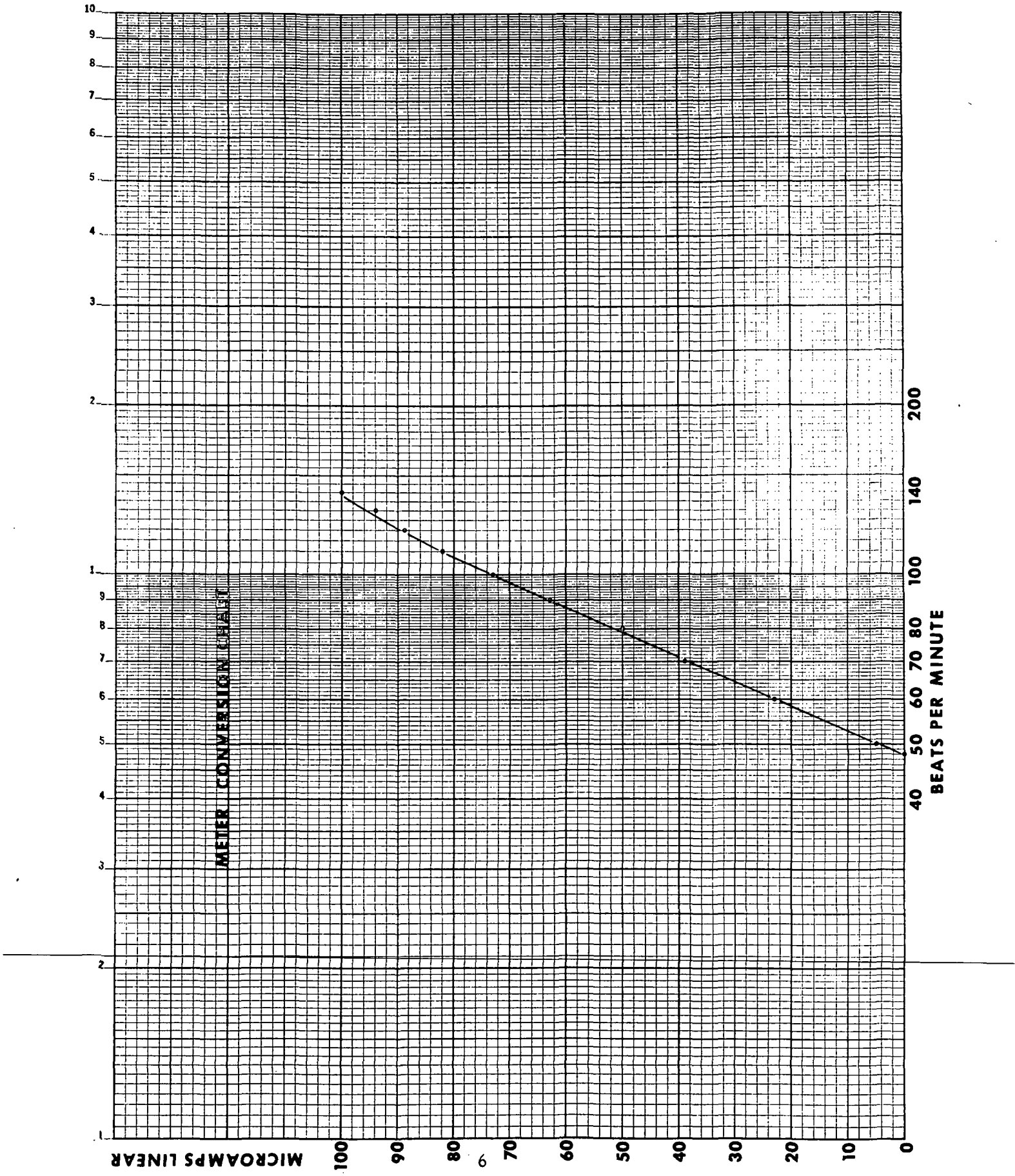
Q_7 and Q_8 buffer the signal from the .1 microfarad capacitor to provide a low impedance output. The 20 k ohm potentiometer permits calibration of the meter.

Each succeeding pulse triggers the events described above so the output voltage is proportional to the reciprocal of the time between the most recent pair of pulses.

IV. Summary

Since the exponential discharge of the 4.2 microfarad capacitor and the 270 k ohm resistor approximates a hyperbola, the output is linear only from 30 to 150 beats per minute. To further improve linearity, this device is calibrated from 40 to 140 beats per minute. Figure 3 is a conversion chart for calibrating a linear meter to the exponential output. Layout and fabrication is not critical and due to the digitizing effect of the monostable multivibrators, noise other than faulty electrode application is not a problem.

Figures 4 and 5 show the layout and auxillary telemetry units.


METER CONVERSION CHART
MICROAMPS LINEAR
BEATS PER MINUTE
10
9
8
7
6
5
4
3
2
1
100
90
80
70
60
50
40
30
20
10
0
200
140
100
80
70
60
50
40

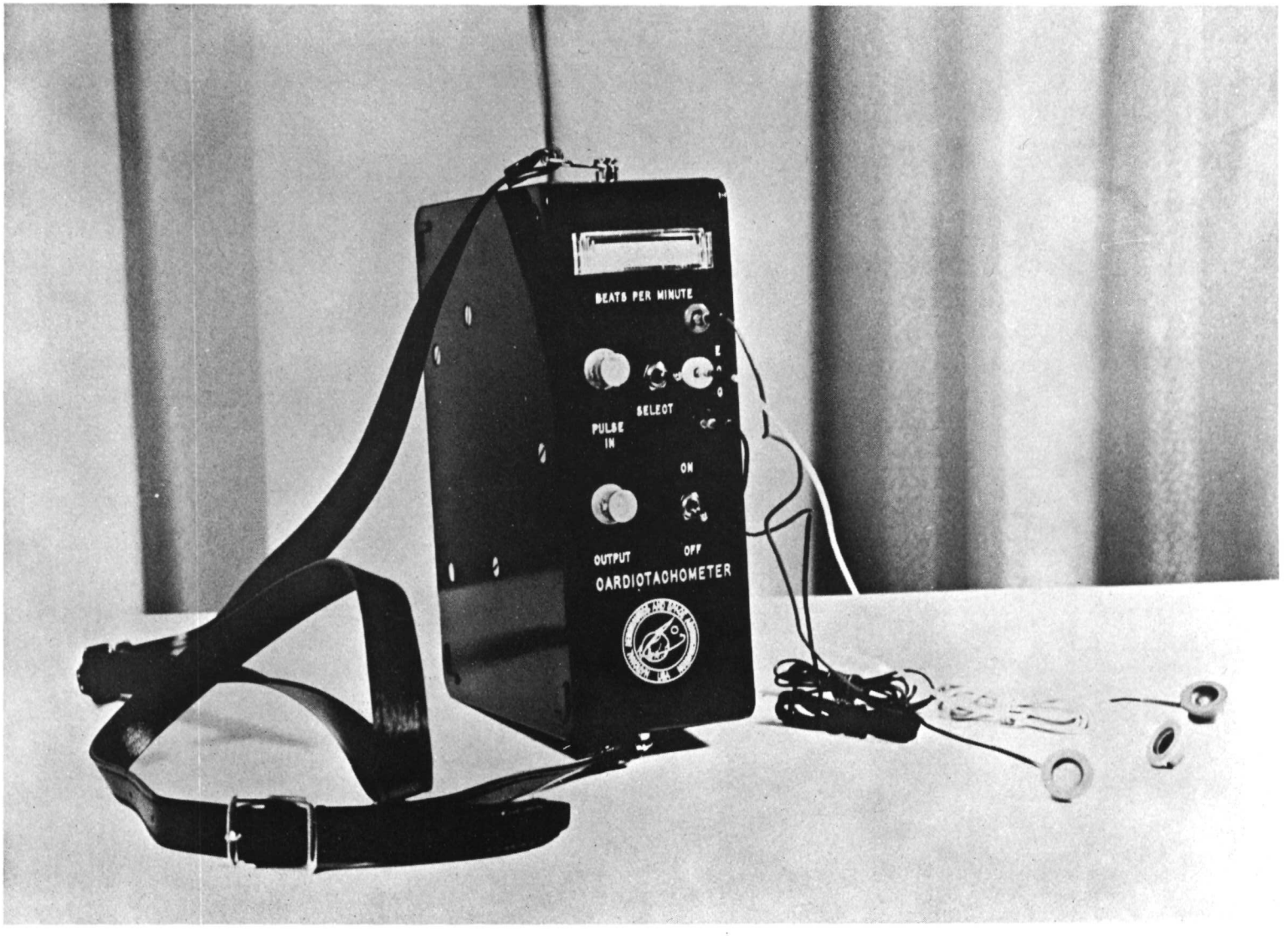


Figure 4(A) Instrument

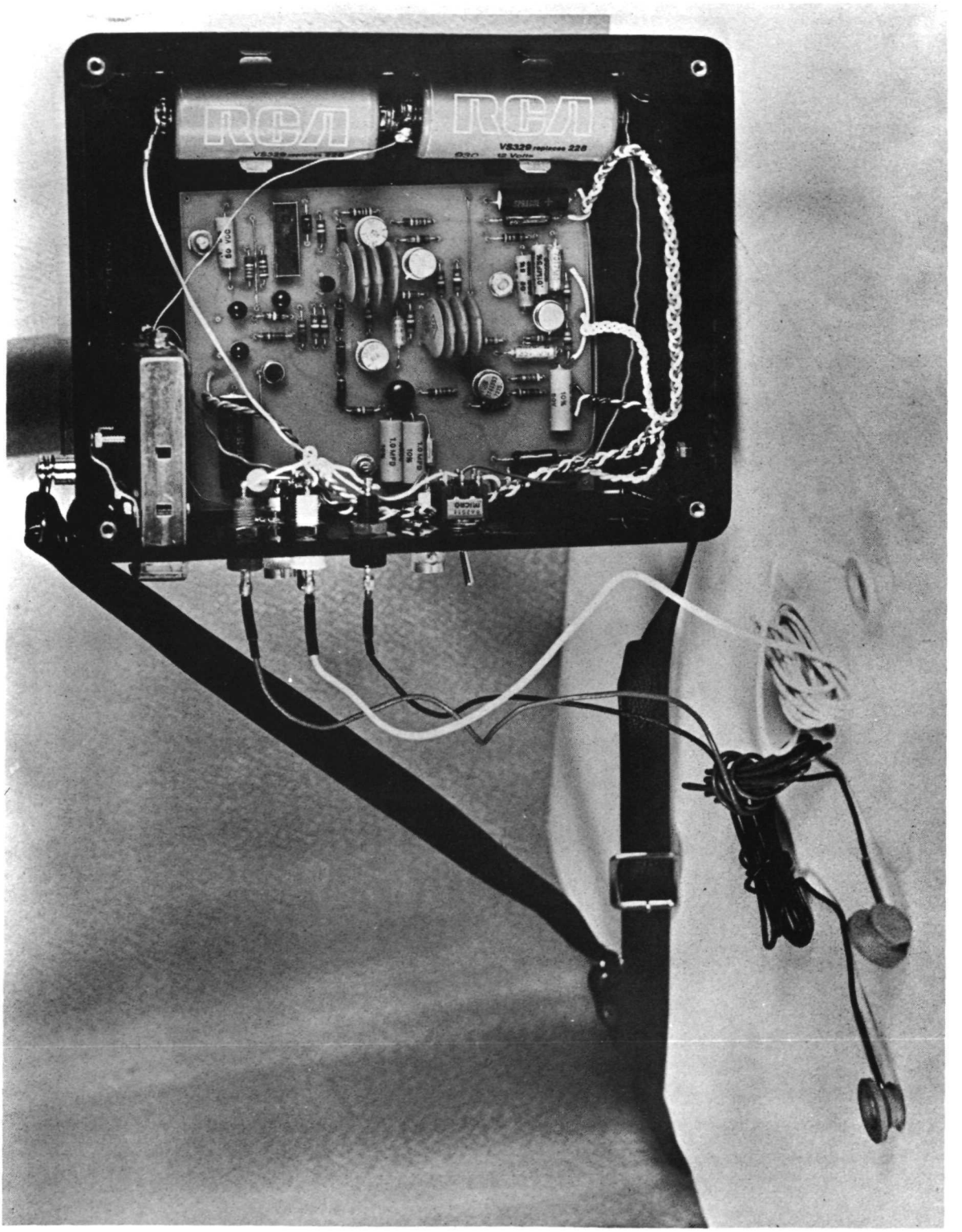
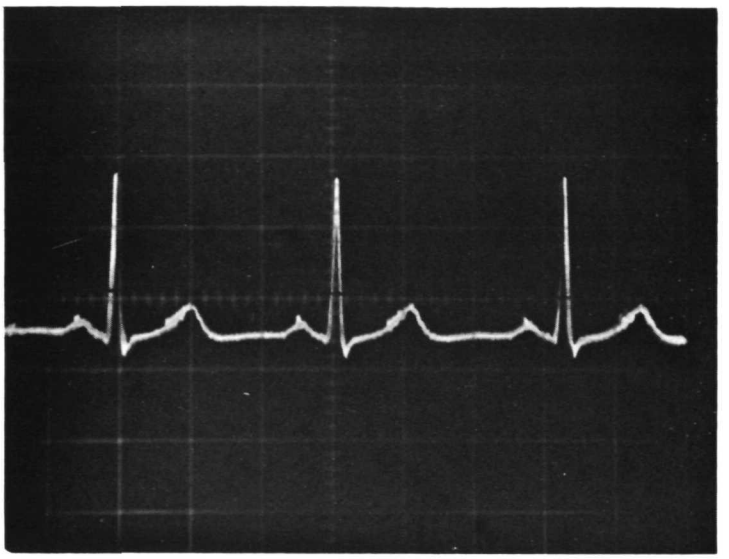


Figure 4(B) Instrument

Figure 5 Telemetry

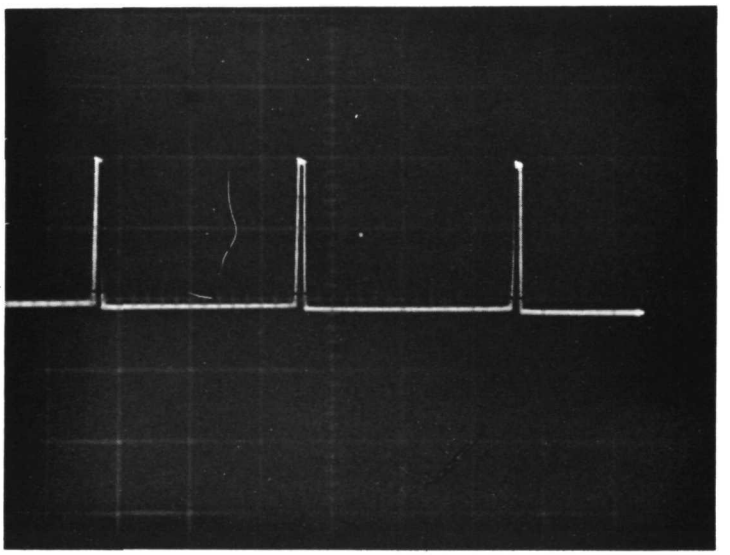
APPENDIX A

WAVEFORMS



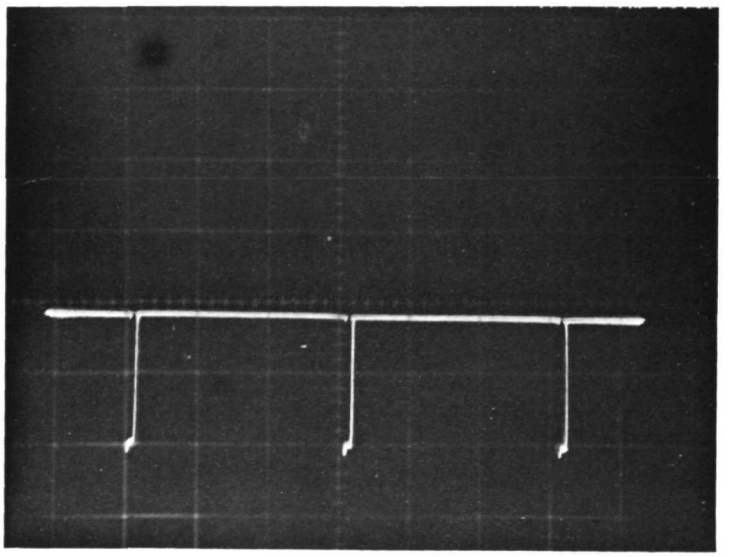
1 ECG or PULSE

VOLTS 2Volts/Cm
TIME .2Sec/Cm



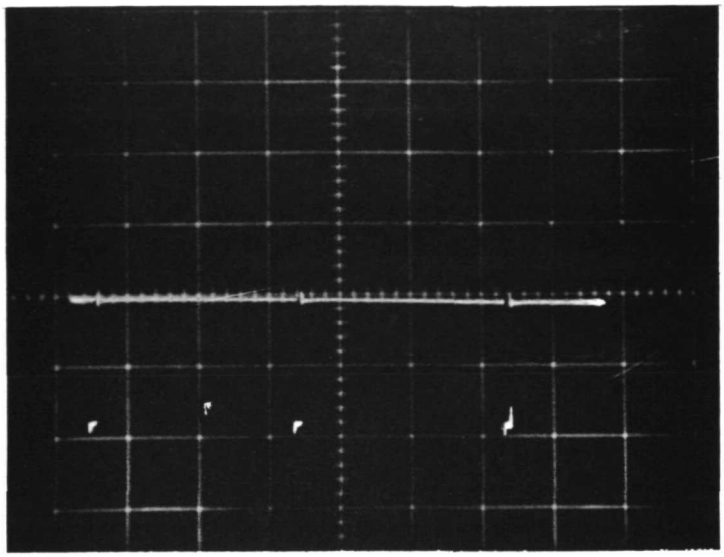
2

VOLTS 10Volts/Cm
TIME .2Sec/Cm



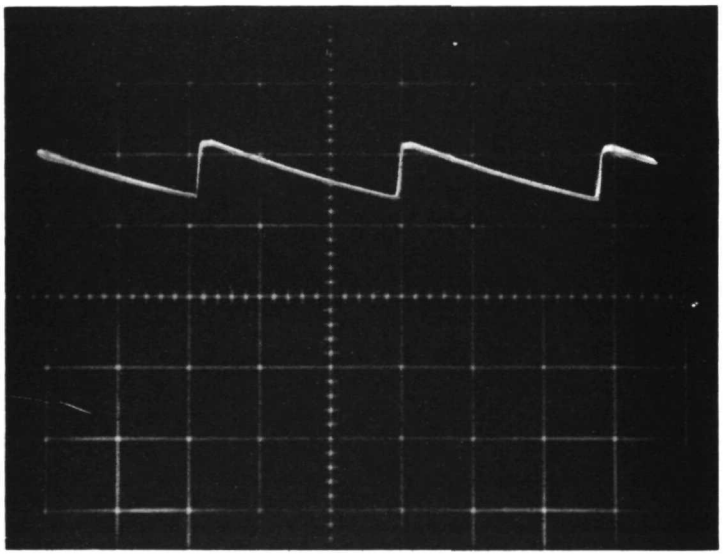
3

VOLTS 5Volts/Cm
TIME .2Sec/Cm



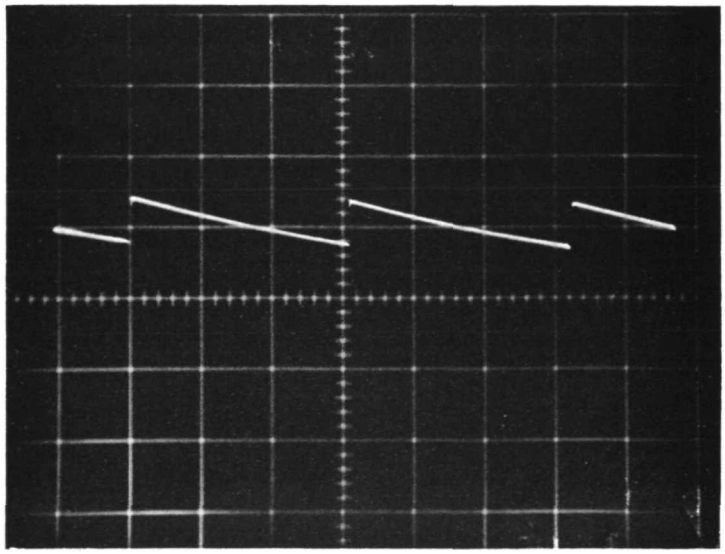
4

VOLTS 5Volts/Cm
TIME .2Sec/Cm



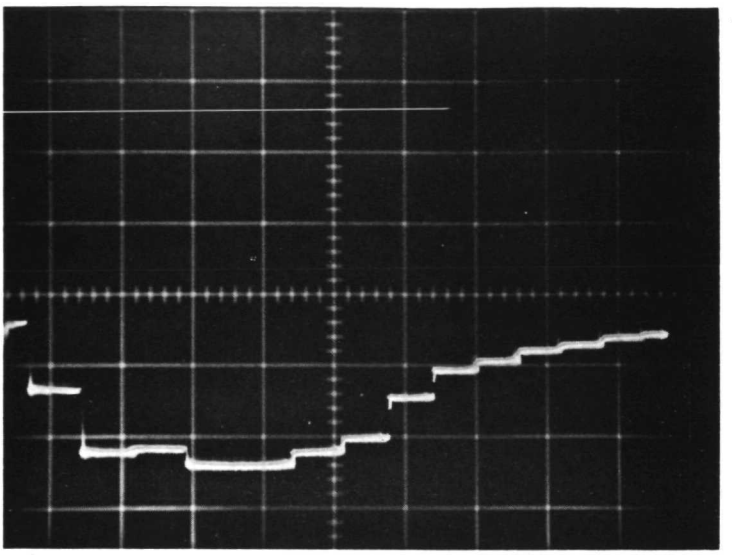
5

VOLTS 5Volts/Cm
TIME .2Sec/Cm



6 SAMPLE AND HOLD

VOLTS 5Volts/Cm
TIME .2Sec/Cm



7 OUTPUT

VOLTS 5Volts/Cm
TIME .2Sec/Cm

APPENDIX B

PARTS LIST

TVA-2/AEB-2 CARDIOTACHOMETER

Parts List

Integrated Circuits
- Fairchild μA 735 - 1
- Fairchild μA 741 - 1

Semiconductors
- 2N1305 - 3
- 2N3565 - 2
- 2N3638 - 1
- 2N3904 - 1
- 2N4360 - 1

Diodes
- IN645 - 5
- IN2071 - 1

Resistors (1/4W)

150 - 3	39K - 1
220 - 2	47K - 2
470 - 1	68K - 1
1K - 2	100K - 3
10K - 8	150K - 1
16K - 1	270K - 1
22K - 2	20M - 1

Potentiometer
- 20K - 1 (pc mounted)

RF Chokes - 100μh - 2

Capacitors (mfd)

.01-1	
.02.1	
.1-1	
.35-2	
1.0-4	
Polarized	
3.0-1	4.7-2
10.0-2	50.0-1

Relay - 1
Clare PRB 2513

Switches
- SPDT - 1 (Select)
- DPST - 1 (Power)

Batteries
Burgess PM 8 - 2
12v
Holder

Meter
100 na dc
Weston Mod 111

Enclosure
Davies 260
Instrument Case

Connector
- ECG - 3 Johnson Jax

Pulse - BNC
Out - BNC

AEB-2 DEMODULATOR

Parts List

Integrated circuits
Siliconix NE561B PPL-1

Diodes
- 1N645 - 2

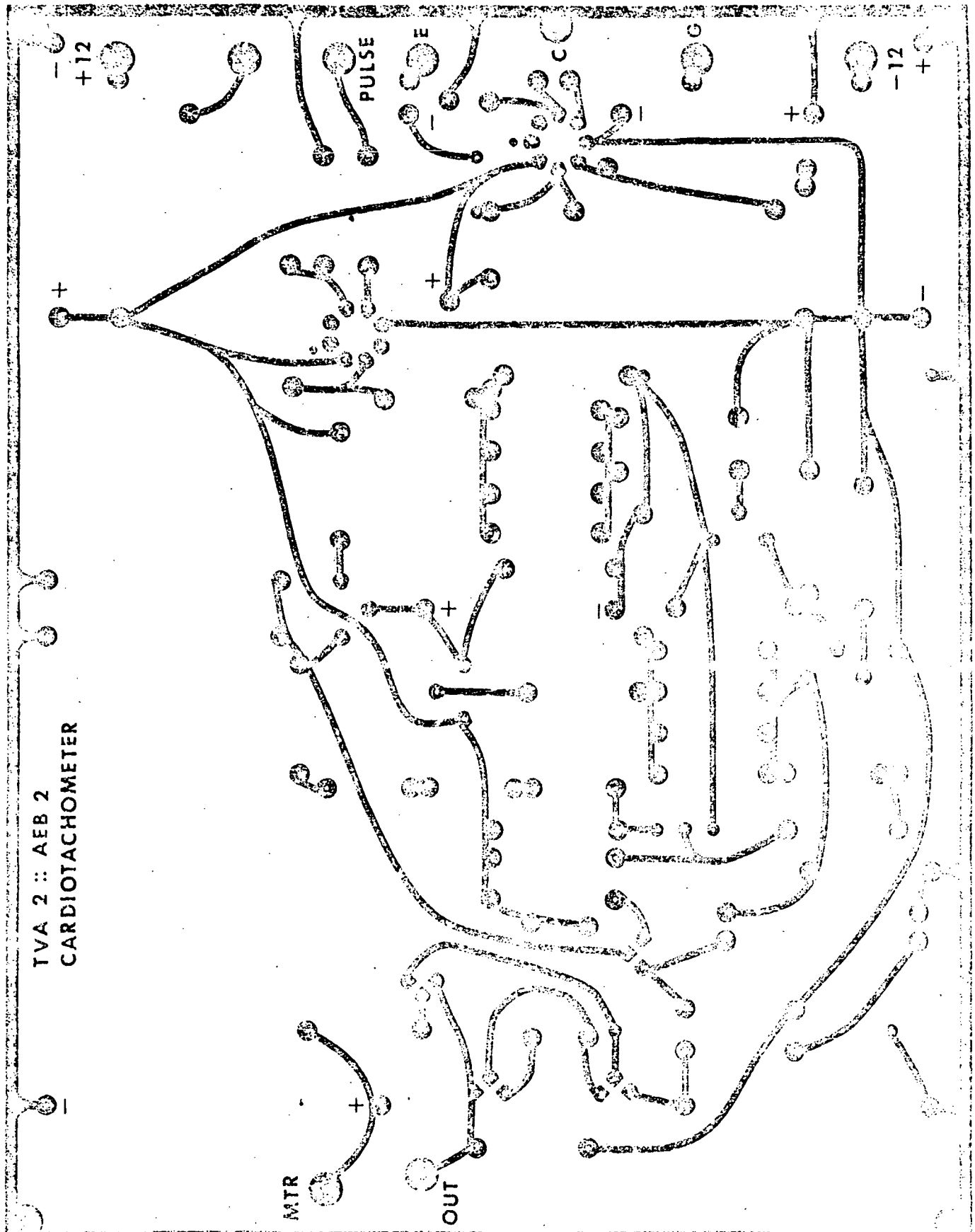
Resistors
- 15K - 1

Capacitors (mfd)
- .01 - 2 ea
- .1 - 1 ea
- 1 - 1 ea
- 2 - 1 ea

Potentiometer
- 10 k - 1 ea

APPENDIX C

BOARD LAYOUT


TVA 2 :: AEB 2
CARDIOTACHOMETER
+12
PULSE
E
C
G
−12
+
−
MTR
OUT

VI. CONTACTS

A. CONTACTS WITH CURRENT USER INSTITUTIONS

On the following pages are described contacts with currently active user institutions that occurred during the period covered by this report.

2 January 1973 Sam McFarland, SwRI, telephoned Elmo Knoch, Arkansas Enterprises for the Blind, to inquire what he has heard from Thomas Rowan regarding AEB-4 device.

2 January 1973 Sam McFarland, SwRI, telephoned W. Sanford Topham, Heart Test and Evaluation Facility, Salt Lake City, Utah, to inquire as to whether input from MSC and Kennedy had been incorporated in data facility there. He said "no" but that it may yet be incorporated in the future. We agreed to make problem inactive for reasons of no further interest.

4 January 1973 P. McGraw, University of Texas Medical Branch at Galveston, telephoned Robert Wilbur, SwRI, to inquire about new transmitter section for the ICP telemetry to move carrier frequency away from interference. Also asked about progress on radiation catheter. GLM-5 and -35)

4 January 1973 Sam McFarland, SwRI, wrote Mary Joyce Newsom, TIRR, to report slow progress on HUV-22, Driving Assist for Triplegics, because of lack of receipt of sufficient input.

4 January 1973 Charles Laenger, SwRI, visited Callier Hearing and Speech and contacted the following: Geo M. Gerken - he is doing stereotaxic work with cats on specific area cochlear stimulation. They with to computer control their stereotaxic apparatus and to obtain data by this means. They have several projects under consideration and will contact us further; Geo. Mouschegian, Director - He is analyzing evoked cortical responses via CAT equipment. They intend to analyze these data with the computer and are seeking methods and means for processing and categorizing such information. They requested that we forward any new information and update where appropriate; Dr. Hammer - He is still interested in an implanted hearing aid and work is continuing. He will contact us when appropriate. He complimented our efforts for Callier.

5 January 1973 Robert Wilbur, SwRI, provided F. Hermann Rudenberg, The University of Texas Medical Branch at Galveston, with additional technical support data on ICP telemetry unit.

6 January 1973 Sam Schiflett, Consultant at Texas Tech, visited William Landers, Ph. D., Psychology, Texas Tech, and obtained new problems:TTU-4, Activity Monitor, TTU-3, Rate Monitor SIB.

6 January 1973 Sam Schiflett, Consultant at Texas Tech, visited Bill Locke, Ph. D., Psychology, Texas Tech, and delivered search results and reviewed abstracts. Also discussed new specifications for his problem TTU-1, Activity Station.

6 January 1973 Sam Schiflett, Consultant at Texas Tech, visited Charles Halcomb, Ph. D., Director of experimental programs, to deliver search results and review abstracts for TTU-2. Dr. Halcomb will order documents.

8 January 1973 John Sigmon, SwRI/MSC, delivered part of EKG telemeter system to Robert Sine, M. D., Rosewood General Hospital. Dr. Sine decided EKG transmitter needs new packaging with on/off switch.

8 January 1973 Paul Johnson, University of Arizona Medical Center, asked Robert Wilbur, SwRI to keep problem TCM-3 active and run another search if new information is available that may lead to an inexpensive system.

8 January 1973 John Ross, Private Practioner, inquired about progress on timing circuit for patient reminder recorder. (PPR-1)

8 January 1973 Dr. Sine, Rosewood General Hospital, advised Robert Wilbur, SwRI, that he desires a different case with an off/on switch for the telemetry transmitter. (RRC-2)

9 January 1973 Erika Hansen, Medical Librarian, Hollywood Presbyterian Hospital, at Dr. Charles Bechtol's request, inquired where they could get a few listings of journals on a search which were not available through PSRMLS.

11 January 1973 Jean Carter, SwRI, forwarded Dr. Donald Lyman, University of Utah a copy of NASA CR-1938, The Fluid Mechanics of Thrombus Formation, to implement reference material compiled so far for Problem UTM-41, Measurement of Thrombus Adhesion to Blood Vessel Wall.

12 January 1973 John Sigmon, SwRI/MSC, wrote Dr. James Frost, Baylor School of Medicine, to inquire about computer interpretation of EVR data.

12 January 1973 John Sigmon, SwRI/MSC, contacted Dr. Neil Burch, Baylor School of Medicine, to inquire about computer interpretation of EVR data.

12 January 1973 Jean Carter, SwRI, telephoned David Milne, VA Hospital, Long Beach, to further define his need on LVA-8 materials to line diet mixing bowls with material to eliminate trace metal contaminants. He need actual samples of materials for testing before he can proceed.

12 January 1973 Sam McFarland, SwRI, visited Mrs. Phyllis Wyeth, New York City, to discuss progress and schedule on SwRI-1.

12 January 1973 Jean Carter, SwRI, telephoned David Hussey, M. D., M. D. Anderson Hospital, to update status of problem MDA-1, Radiation Resistant Materials for Patient Tilt Table. Recent computer search gave us two materials, special epoxy coatings and a polymer called pyrrone to get further information on. He is still interested and has the facility to test the materials should we be able to get any.

12 January 1973 John Sigmon, SwRI/MSC, forwarded Dr. J. J. Smith, University of Wisconsin Medical School name and address of Dr. J. M. Lagerwerff, Lockheed Missles & Space Co. for blood pressure monitor designed to reject noise.

15 January 1973 Jean Carter, SwRI, telephoned Jim Caylor, Texas Commission for the Blind, to inquire about status of bead -coated canes for the blind (TCB-18) sent for evaluation. They are assigned to blind clients at present and are working extremely well. They are appreciative of the cosmetic appearance of the coated canes and have noticed no chipping or effects of hand moisture on the coating to date. They will have them a few weeks more for thorough testing. In the meantime, they are sending another rigid shaft cane for a solid coating of the smallest bead sample which is proving to be the best one. Also discussed possible progress on TCB-17, Navigational Assistance to Keep a Blind Person in a Set Direction.

15 January 1973 Jean Carter, SwRI, forwarded David Milne, VA Hospital, Long Beach, commercial source of new polyethylene called "pactene"! This was most promi sing solution to date. Material has no metal or silicon content and can be molded into bowls for LVA-8.

15 January 1973 Jean Carter, SwRI, telephoned Elmo Knoch, Arkansas Enterprises for the Blind, to inform him of status of aethesiometer fabrication (AEB-4). As soon as it is cleared with the NASA patent counsel, SwRI will proceed to build a prototype unit for his evaluation.

15 January 1973 Mrs. Kersenbrock, RN, Craig Rehabilitation Hospital, wrote Sam McFarland, SwRI, to invite SwRI to a return visit in late January or early February.

16 January 1973 John Sigmon, SwRI/MSC, visited Dr. Wright, Baylor College of Medicine, to pick up EKG telemetry device on loan to Dr. DeBakey.

16 January 1973 Sam McFarland, SwRI, and John Sigmon, SwRI/MSC, visited Mickie Spence, P. T., John Sealy Hospital, and showed her stretcher cradle designed by School of Aerospace Medicine, rubber impregnated nylon "bladder material" from MSC as potential application in burn-stretcher, and quick connect pins for replacing screws in crutches.

17 January 1973 John Sigmon, SwRI/MSC, wrote Walter Schrieber, M. D., VA Hospital, Long Beach, to inquire if he was still active on LVA-3. Told him about photographic emulsion

18 January 1973 Jean Carter, SwRI, forwarded David Milne, VA Hospital, Long Beach, information on B72-10243, Quartz Crystal Microbalance Used in Biological Studies, and B72-10298, Real-Time Pair-Feeding of Animals, for possible interest in his experimental work with metabolic diseases using rats in isolation chambers.

22 January 1973 Jean Carter, SwRI, sent Nancy Thistle, R. N., Craig Rehabilitation Hospital, computer search results on problem CRH-6, Urine Collection Device for Incontinence in Female."

23 January 1973 Sam McFarland, SwRI, telephoned Robert Sine, Rosewood General Hospital, to request name of supplier of EM needle. Also discussed progress on athetoid helmet. He offered to send a letter supporting the need for the helmet in training stroke victims.

24 January 1973 Jean Carter, SwRI, forwarded Erika Hansen, Hollywood Presbyterian Hospital, copies of 3 articles from RECON search for Dr. Charles Bechtol on "Effects of High Altitude on Red Blood Cell Formation."

25 January 1973 Jean Carter, SwRI, forwarded Edward C. Beck, VA Hospital, Salt Lake City, RECON search results on SLU-1, "Elimination of Motion Artifact of EEG Leads in Pedestal Equipped Animals."

29 January 1972 Erika Hansen, Hollywood Presbyterian Hospital, wrote David Culclasure, SwRI, to request a high altitude anoxia search for Dr. Bechtol .

29 January 1973 Charles Laenger, SwRI, forwarded information to Dr. Jordan, VA Hospital, Memphis, on Mictiograph (Siemen Product) via Jack Johnson.

30 January 1973 Jean Carter, SwRI, forwarded Margaret Kersenbrock, Craig Rehabilitation Hospital, an article on radiofrequency electrophrenic ventilatory support system and updated present status of problem CRH-4, Portable Breathing Machine.

30 January 1973 James Frost, Baylor College of Medicine, forwarded answer to inquiry from John Sigmon, SwRI/MSC, regarding program analysis of evoked cortical response data (SWC-2).

30 January 1973 John Sigmon, SwRI/MSC, telephoned Dr. Shurley, VA Hospital in Oklahoma City, to inquire about progress with sleep monitor cap on loan from SwRI.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

VI. CONTACTS
B. CONTACTS WITH POTENTIAL USER INSTITUTIONS

On the following pages are described contacts with potential user institutions that occurred during the period covered by this report.

2 January 1973 F. O. DeSautels, Consultant, visited Lt. Col. Jack Gehrin ger, AMC Nurse Methods Analyst at Brooke Army Medical Center to introduce BAT program.

3 January 1973 Col. G. Woodard, Brooke General Hospital visited SwRI in reference to leg braces and other material related to hospital and patient care.

5 January 1973 George Woodard, M. D., Deputy Commander, Brooke General Hospital, visited the SwRI BATeam to explore possible interaction between the team and Army Medical Service activities.

11 January 1973 F. O. DeSautels, Consultant, introduced BAT function to Col. John Simmons, M. D., Brooke General Hospital. The possibility of automatic peripheral scanner adaptation in screening patients in large clinical facility was discussed.

15 January 1973 Jack Jonas, United Cerebral Palsy Assn. of Kansas, wrote David Culclasure, SwRI, to request team visit to discuss rehabilitation potential of team/association interaction.

16 January 1973 Jean Carter and Charles Dreyer,SwRI, and Frank DeSautels, Consultant, visited and showed film on NASA/Ames developed visual sensitivity tester to John Simmons, Chief of Opthamology at Brooke Army Medical Center. With a current workload of up to 50 people per day for visual screening, their need is established. They exp a desire to obtain a machine for evaluation and requested a complete list of cassette tests.

17 January 1973 F. O. DeSautels, Consultant, introduced BATeam function to Maj. Gen. Kenneth D. Orr, M. D., Brooke General Hospital. Left annual report.

18 January 1973 F. O. DeSautels, Consultant, visited Medical Service Agency of Combat Development Command and discussed function and use of BATeam. Two hour review of potential applications with staff headed by Col. Marvin Nation MSC. Also visited Col. W. Moore, Chief, Infectious Disease Service, Brooke General Hospital (also member of Chemical Research Council)

19 January 1973 F. O. DeSautels, Consultant, visited with Lt. Col. H. Gustin, MSC and Kenneth Coburn, Ch. Engr. Reviewed possible application of NASA developed equipment and means of documenting information to the entire Army Medical Department more quickly.

19 January 1973 Ms. Carter Cloptan, Texas Commission for the Aging, wrote David Culclasure, SwRI, to arrange for meeting with team to discuss problems of the aging (for consideration under the TU program).

23 January 1973 Anne Kohler, Texas Commission on Aging, telephoned David Culclasure, SwRI, to discuss several areas in which the team might interact on problems of the aging.

27 January 1973 F. O. DeSautels, Consultant, visited Capt. Gilbert Sosa, Physical Therapy, Brooke General Hospital, to acquaint him with BAT program.

25 January 1973 Sam McFarland, SwRI, and John Samos, TUO/Langley visited Peninsula Cerebral Palsy Training Center, Hampton, Virginia. They visited with Mr. Clifton L. Pleasants, Director, and five other personnel. The patient assist device, puff switch, and temper foam were demonstrated and literature disseminated.

31 January 1973 Anne Kohler, Texas Commission on Aging, telephoned David Culclasure, SwRI, to request team examine several areas where NASA technology might be applied to problems of the aging.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

VI. CONTACTS
C. CONTACTS WITH NASA CENTERS

On the following pages are described contacts with NASA Field Centers that occurred during the month covered by this report. The contacts are divided into two groups: problem-related contacts and non-problem related contacts.

2 January 1973 Juan Pizarro, MSFC, telephoned David Culclasure, SwRI, to provide information on availability of bone densitometer.

2 January 1973 David Culclasure, SwRI, telephoned Jeff Hamilton, TAD/NASA, to discuss BAT exhibit at Washington, D. C. (Congress of Rehabilitation Medicine).

2 January 1973 John Sigmon, SwRI/MSC, telephoned James Wiggins, TUO/MSFC, to obtain information on Electron Micrograph Techniques (UTM-43); Liquid Crystals in Renal Flow Detection Synthesized for GLM-39.

2 January 1973 John Sigmon, SwRI/MSC, telephoned Dr. Federson, MSC, inquired about improved perceptual motor performance measurement system as per request of David Culclasure. Dr. Federson advised promised device has been sent to Texas Tech.

2 January 1973 Over Dr. Pool's signature, John Samos, SwRI/MSC, wrote John Samos, TUO/Langley, to inquire about status of system for SWC-2.

3 January 1973 John Sigmon, SwRI/MSC, telephoned John Samos, TUO/Langley, to check on progress of Mr. Husson and Mr. Nichols' Microelectronics section on TCD-4. Also found out that Langley has not done work with starch molds.

3 January 1973 Jean Carter, SwRI, telephoned Bradford Evans, TUO/Ames, to verify shipment of a film on the Ames Developed "Visual Sensitivity Tester" for use in potential development of new problem on automated glaucoma interocular pressure survellience monitor.

3 January 1973 Charles Laenger, SwRI, telephoned Dr. Sam Pool, MSC, and John Sigmon, SwRI/MSC, to discuss fabrication of one patient assist device. He requested a written estimate for (1) copy existing device, (2) incorporate various improvements and (3) suggest alternatives.

3 January 1973 John Sigmon, SwRI/MSC, telephoned Charles Laenger, SwRI, on a conference call with Dr. Pool, MSC, about patient assist unit proposal by Mr. Schrader.

3 January 1973 Juan Pizarro, MSFC, telephoned John Sigmon, SwRI/MSC, to clarify what technical information was wanted in regards to UTM-43 and BLM-17.

4 January 1973 Sam McFarland, SwRI, forwarded John Samos, TUO/ Langley, Dr. Sine's comments on Dr. Herring's letter and a sample of present electromyographic needle employed by Dr. Sine. (RRC-8)

4 January 1973 Dick Miner, NASA Headquarters, telephoned David Culclasure, SwRI, to request list of potential users for the complex coordinator.

5 January 1973 Dick Miner, NASA Headquarters, telephoned David Culclasure, SwRI, to request names of potential users of the EPIC device. He discussed arrangements to get an EPIC apparatus for work sampling evaluation.

5 January 1973 James Wiggins, MSFC, provided Technical Support Package on bone desitometer requested earlier for evaluation in terms of kidney stone detector.

5 January 1973 John Samos, TUO/Langley, forwarded a response to David Culclasure, SwRI, on the problem involving highly abrasive-resistant mixing bowls for nutrition studies.

5 January 1973 Charles Laenger, SwRI, telephoned Don Freedman, Goddard, to arrange to visit him on Monday, 8 Jan. Will take him a patient assist device.

8 January 1973 Jean Carter, SwRI, forwarded Technical Support Package for HSR-7, Patient Assist Control Device, per request to Wayne Chen, Goddard.

8 January 1973 Horace Emerson, Ames, forwarded demonstration film of NASA developed visual sensitivity tester. Film will be shown to all pertinent SwRI BATeam personnel and then to interested personnel at Brooke Army Medical Center for possible problem implementation.

8 January 1973 Charles Laenger and Sam McFarland, SwRI, visited Goddard. Delivered patient assist device and hand switch. Demonstrated unit and discussed its application relative to VA experience and need.

8 January 1973 John Samos, TUO/Langley, telephoned David Culclasure, SwRI to make arrangements for team to meet with cerebral palsy group to discuss team activities.

8 January 1973 Dick Miner, NASA Headquarters, telephoned David Culclasure, to discuss arrangements for demonstration of technology applications at NASA Headquarters during February.

8 January 1973 Robert Wilbur, SwRI, forwarded Juan Pizarro, MSFC, disclosure and technical support package on cassette recorders.

9 January 1973 Juan Pizarro, MSFC, sent requested information to John Sigmon, SwRI/MSC, on GLM-43 and BLM-17. (Electron Microscope Topography and Renal Arterial Flow)

10 January 1973 David Culclasure, SwRI, visited Jeff Hamilton, NASA Headquarters, to discuss plans for the team's program review in mid-February.

10 January 1973 Wm. F. Barrows, Ames, provided TSP to David Culclasure, SwRI, on implanted telemetering system for ECG and body temperature.

10 January 1973 David Culclasure, SwRI, visited Bob Zimmerman, NASA Headquarters, to review team activities in rehabilitation medicine area.

10 January 1973 Charles Laenger, Sam McFarland, and David Culclasure, visited Tom Wakefield, Jeffery Hamilton and Bob Zimmerman, NASA Headquarters, to discuss status of patient assist device and other hardware efforts. Goals and responsibilities of the SwRI BATeam were discussed. Geographical boundaries are not important; were given authority to visit Moss Rehabilitation in Pennsylvania and to re-establish contacts in California.

10 January 1973 Sam McFarland, SwRI, visited Harvey Herring, LRC, to discuss teflon coating problems on needles for RRC-6.

10 January 1973 N. P. Butler, JPL, provided David Culclasure, SwRI, Technical Support Package on a microbalance which may have implications for several SwRI problems.

10 January 1973 Charles Laenger, and Sam McFarland, SwRI, visited Wayne Chen and Don Friedmann, Goddard, to deliver Patient Assit Device for evaluations.

10 January 1973 Sam McFarland, SwRI, visited John Samos, TUO/Langley, to discuss TCD-2 and -3 and progress of other problems being serviced by LRC researchers.

11 January 1973 David Culclasure, SwRI, visited Tom Wakefield, TAD/NASA, to acquaint Mr. Wakefield with the status of the various AE candidates the team is working on and plans for future submissions.

11 January 1973 *Dick Miner, NASA Headquarters, telephoned Robert* Wilbur, SwRI, to inquire about status of complex coordinator and if we were planning on evaluation in the near future.

11 January 1973 Jean Carter, SwRI, returned duplicate film print to Bradford Evans, Ames/TUO, on "Visual Sensitivity Tester".

11 January 1973 John Samos, TUO/Langley, telephoned Charles Laenger, SwRI, to discuss January 25 meeting at Langley with Cerebral Palsy people.

12 January 1973 H. A. Leon, Ames, provided Technical Support Package on a device for real-time pair feeding of animals, has implications for University of California at Davis problem statement.

15 January 1973 Jean Carter, SwRI, telephoned Warren Kelliher, Langley, in reference to a NASA developed material, a polymer called pyrrone. The material is highly radiation resistant. Possible solution for our problem MDA-1 for radiation resistant material for fabricating a tilt table for radiation therapy.

15 January 1973 Jean Carter, SwRI, telephoned Henry Martin, MFSC, to request return of photocell cane. Discussed possible modifications and rework being planned, i.e. voltage regulator, use of wheel and feeler antennae and light presence detector attachments.

15 January 1973 John Sigmon, SwRI/MSC, telephoned Bill Shuma e, MSC, regarding cost and availability of sleep monitor cap and current information on Dr. Frosts (Bayor) work on sleep experiments.

15 January 1973 John Sigmon, SwRI/MSC, telephoned James Waligora, Environmental Physiology Lab/MSC, regarding extension of loan of ECG.

15 January 1973 George Doland, MSC, provided Technical Support Package on an improved learning decoder which may have implications for several VA problems.

16 January 1973 David Culclasure, SwRI, provided Tom Wakefield, TAD/ NASA recommendations for the Veterans Committee meeting scheduled 31 January.

16 January 1973 Jean Carter, SwRI, telephoned Juan Pizarro, MSFC, to verify shipment of the HSR-7 patient assist unit back to SwRI.

16 January 1973 David Culclasure, SwRI, requested permission from Edward Michael, MSC, for a short term loan of a EEG soft cap and preamp system for further application design and documentation.

16 January 1973 David Culclasure, SwRI, provided Harrison Allen, Lewis, with information on the NASA BAT exhibit. NASA/Lewis desires to display it at Cleveland's Health Museum and Education Center.

16 January 1973 James Waligora, MSC, sent John Sigmon, SwRI/MSC, a copy of bibliography on Head Liquid Cooling research .

16 January 1973 George Hoffler, MSC, telephoned John Sigmon, SwRI/MSC, regarding possibility of use of NASA EKG contouroscope application to speech analyzer (TCD-5).

16 January 1973 John Sigmon, SwRI/MSC, requested technical information on ear oximeter developed at Ames from Bradford Evans, TUO/Ames. (LLU-10)

17 January 1973 Dick Miner, NASA Headquarters, telephoned Robert Wilbur, SwRI, to inquire if progress was being made in repairing the complex coordinator. Mr. Miner was informed of the problems encountered in the complex coordinator.

17 January 1973 John Sigmon, SwRI/MSC, forwarded memo from Dr. Culclasure to Dr. E. L. Michel on possible loan of sleep cap.

17 January 1973 John Sigmon, SwRI/MSC, inquired from Jim Wiggins, TUO/MSFC, about status of speech analyzer on which patent is pending. (GLM-39)

18 January 1973 John Sigmon, SwRI/MSC, telephoned Robert Wilbur, SwRI, to request him to fabricate new packaging for EKG transmitter with on/off switch for Dr. Sine.

18 January 1973 Don Friedman, Goddard, telephoned Charles Laenger, SwRI, to inquire a to where the reduced gravity simulator was installed. He was given Joe Canzoneri's address.

19 January 1973 John Samos, TUO/Langley, telephoned David Culclasure, SwRI, to request team visit to LRC on 25 January to discuss AE problems.

19 January 1973 Tom Wakefield, TAD/NASA, notified David Culclasure, SwRI, that the team program review was scheduled for February 13.

19 January 1973 Donald Zylstra NASA Headquarters, provided David Culclasure, SwRI, with information on material NASA had compiled on noise pollution.

19 January 1973 Jean Carter, SwRI, requested technical support package for TSP72-10526, Carbon Dioxide Concentration Indicator, from NASA Headquarters.

22 January 1973 David Culclasure, SwRI, telephoned John Samos, TUO/Langley, to discuss obtaining an improved model of the complex coordinator.

22 January 1973 David Culclasure, SwRI, telephoned Tom Wakefield, TAD/NASA, to discuss arrangements for the presentation to be held for the VA in Washington on 31 January.

23 January 1973 Albert Bradley, MSC, wrote David Culclasure, SwRI, to concur in allowing the SwRI MSC representative (John Sigmon) to use MSC library facilities.

23 January 1973 Jeff Hamilton, TUO/NASA, telephoned David Culclasure, SwRI, regarding arrangements for rescheduling the VA meeting.

23 January 1973 James O. Harrell, JFK, requested information on team activities concerning aids for the handicapped.

23 January 1973 Robert Wilbur, SwRI, telephoned Dick Miner, NASA Headquarters, to relay information on troubles with second complex coordinator. Mr. Miner assured that action will be taken.

23 January 1973 Robert Wilbur, SwRI, forwarded Jeff Hamilton, TUO/NASA technical support package on cardiotachometer for his files.

23 January 1973 Robert Wilbur, SwRI, forwarded Tom Wakefield, TAD/NASA, technical support package on cardiotachometer.

23 January 1973 Jean Carter, SwRI, telephoned Richard Haines, Ames, to request visual sensitivity tester for the problem originator to evaluate. Permission was granted provided proper scheduling was worked out. (BMC-7)

24 January 1973 Sam McFarland, SwRI, visited John Samos, TUO/ Langley. Cooperation between SwRI BATeam and Langley was discussed as well as many problems. Langley uses numerous modes for gaining attention to problems (weekly entrees in base paper, cards for cafeteria tables, calls, leters, etc. They have no record of response on UTM-38 (urethral valve); have sent in a Tech Brief on the Breath Switch; the tongue switch for Rancho has been dropped by Mr. Muller but Westinghouse is interested in working on it. Mr. Samos requested Charles Laenger, SwRI, accompany him to local Cerebral Palsey to visit Dr. Kaffros to present possible NASA products useful to their patient. Thirty problem statements were given to Mr. Samos.

25 January 1973 Jean Carter, SwRI, forwarded summaries to Jeff Hamilton, TUO/NASA and Bob Zimmerman SwRI BATeam activities statistics and comments on effectiveness of BATeam efforts in response to comments generated by Dr. Berry.

26 January 1973 Tom Wakefield, TAD/NASA, telephoned David Culclasure, SwRI, to discuss rescheduling the VA subcommittee meeting.

29 January 1973 John Samos, TUO/Langley, forwarded technical support package for patient assist system to David Culclasure, SwRI.

29 January 1973 David Culclasure, SwRI telephoned Dick Miner, NASA Headquarters, to discuss arrangements for getting the EPIC to the 1 February meeting at NASA.

29 January 1973 Gayle Parker, Patent Counsel, NASA, telephoned David Culclasure, SwRI, to discuss an application for licensure in an anesthesiometer (TB72-10032); Arkansas Enterprises For the Blind had requested prototype for evaluation.

29 January 1973 Paul Foster, TUO/Lewis, telephoned Robert Wilbur, SwRI, to discuss problem concerning four county 2-way communication system for fire-police ambulance coordination. Asked for assistance in finding someone to do feasibility or model study.

30 January 1973 David Culclasure, SwRI, telephoned Tom Wakefield, TAD/NASA, to verify time and date of presentation to VA Committee in AR.

30 January 1973 John Samos, TUO/Langley, provided David Culclasure, SwRI, with update information on AE projects at LRC.

30 January 1973 Sam McFarland, SwRI, telephoned Jack Wheeler, TUO/MSC, to request him to contact Ed Fein to seek Patent Council approval to prototype two copies of aesthesiometer for Arkansas Enterprises for the Blind. He relayed the inquiry to Gayle Parker.

30 January 1973 Tom Wakefield, TAD/NASA, telephoned David Culclasure, SwRI, to coordinate presentation to be presented to Veterans Committee.

31 January 1973 Jean Carter, SwRI, forwarded John Sigmon, SwRI/MSC, new problem statement on portable oxygen purifier sent in by Army Combat Development Command at Ft. Sam Houston. Mr. Sigmon will begin initial computer search and find key personnel at MSC who would be able to coordinate the development of this program.

31 January 1973 Gayle Parker, Patent Council, NASA, telephoned Sam McFarland, SwRI, and gave legal o. k. to cooperate with Thomas Rowan on prototyping the aesthesiometer device for Arkansas Enterprises for the Blind.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

VI. CONTACTS
D. OTHER CONTACTS

On the following pages are described other Team contacts that occurred during the period covered by this report.

2 January 1973 Jack Johnson, Consultant, Little Rock, Arkansas, visited with Mr. Forrest Mims and Elmo Knoch at Arkansas Enterprises for the Blind and discussed the possibilities and to observe a test of an infra-red transmitting and receiving device designed by Mr. Mims as an aid for the blind. Mr. Knoch and other AEB personnel were very enthusiastic about this device. Mr. Johnson obtained three problems from Mr. Knoch for literature search.

2 January 1973 Sam McFarland, SwRI, telephoned Martin Criel, Brooks Aerospace, and set up appointment for 3 January to discuss possible BAFB/SAM answers for GLM-43 and -45.

3 January 1973 Jean Carter, SwRI, forwarded Ms. G. Rickerson, R.N. Clifton Heights, Pennsylvania, a copy of the NASA brochure to aid in a seminar preparation at Groynedd Mercy College .

3 January 1973 John Sigmon, SwRI/MSC, requested Jim Smith, Lockheed Missle & Space Company, to forward technical information on blood pressure monitor designed to reject motion artifact for WMC-2.

3 January 1973 Sam McFarland, SwRI, visited Martin Criel, Brooks Air Force Base, School of Aerospace Medicine, to discuss equipment developed for mobile field hospital as possible application to GLM-45.

4 January 1973 Serge Uccetta, ITT, telephoned Jean Carter, SwRI, in reference to letter for fireman's breathing apparatus for problem CRH-4, Portable Breathing Machine. Best help would be in design configuration of tanks (hip-mounted). He is sending drawings.

4 January 1973 F. Thomas Wooten, RTI, forwarded David Culclasure, SwRI, information on problem RTI/VAM-6 requested for similar SwRI problem.

4 January 1973 Jean Carter, SwRI, sent Anne Kohler, Governor's Committee on Aging, a summary statement of NASA concept of biomedical applications teams for entry into convention activities project that SwRI BATeam will be speaking at in October 1973.

5 January 1973 Kathy McCorduck, SRI TAT Team, telephoned David Culclasure, SwRI, to obtain instructions for shipping the EPIC apparatus to SwRI.

5 January 1973 Renee Wallace, New York State Hospitals, telephoned Charles Laenger, SwRI, to request information on Temperfoam and bucket seats.

5 January 1973 Sam McFarland, SwRI, telephoned Thomas Rowan, Rowan Products, Van Nuys, California, in reference to AEB-4. Discussed possibility of SwRI producing a prototype aesthesiometer for Arkansas Enterprises for the Blind under the NASA/AE program.

8 January 1973 Dr. Arthur S. Freese, New York City, requested information on patient assist items covered in rehabilitation brochure.

8 January 1973 Bob Zimmerman, George Washington University, telephoned Robert Wilbur, SwRI, desiring information on the impact of the GE Imblms program for computerizing the Kubicek method. More time will be needed before concrete information would be forthcoming. Mr. Zimmerman desires a thorough cost estimate be prepared prior to a decision on AE acceptance or rejection regarding the digital thermometer for tooth vitality.

8 January 1973 Bob Zimmerman, George Washington University, telephoned David Culclasure, SwRI, to discuss AE candidates and status of several problems indentified in the December report.

10 January 1973 Serge Uccetta, IIT, forwarded configuration drawing of fireman's life support system for reference and possible use for CRH-4, Portable Compact Breathing Machine. He also sent address and phone reference of Flight Research Center in California for additional contact on respiratory monitors.

11 January 1973 David F. Culclasure, SwRI, visited Dan Green, Marketing Mgr., McDonald-Douglas and acquainted him with the BATeam and the "spin-offs" awaiting marketing action.

11 January 1973 Dr. DeLucchi, Biomedical Consultants, offered new material on sleep analyzer for use in annual report.

11 January 1973 Jean Carter, SwRI, forwarded Ed. Roberts, Berkley, California, a copy of NASA brochure on rehabilitation.

11 January 1973 David Culclasure, SwRI, visited Mr. Meadons, C/S Veterans Committee, House of Representatives and participated in presentation to Mr. Meadons of team activities in rehabilitation of possible interest to the VA.

12 January 1973 Jean Carter, SwRI, forwarded to Dr. Robert Galambos, Professor of Neurosciences, University of California at San Diego, all pertinent documents on EEG soft sleep cap, the evoked response EEG audiometric helmet, electrode, and preamp assembly and commercial source for EEG telemetry headband, per his request.

12 January 1973 Sam McFarland, SwRI, visited Dr. Eugene F. Murphy, VA Administrative Offices, New York City, to discuss potential applications of fiber/epoxy composites to prosthetics problems.

12 January 1973 John Sigmon, SwRI/MSC, wrote Pavlovian Laboratories, John Hopkins University, to inquire about computer interpretation of evoked cortical response data.

13 January 1973 Florence L. Huey, RN, American Journal of Nursing, wrote David Culclasure, SwRI, to request article for the magazine.

15 January 1973 John Sigmon, SwRI/MSC, telephoned Mrs. Newcomb, R. N., Methodist Hospital, Houston, trying to locate plastic coated surgical tools.

15 January 1973 John Sigmon, SwRI/MSC, wrote Dr. Tom Castle, Midwest Research Institute, to inquire about information on muscle accelerometer developed by Ames & MRI BATeam.

15 January 1973 Charles Laenger, SwRI, telephoned Don Weekly, New Orleans, to advise him of NASA Goddard and NASA MSC interest in the patient assist device. His principals have made no further moves but he will call when they do.

16 January 1973 Stanford TATeam forwarded complex coordinator for major repair and overhaul.

16 January 1973 Sam McFarland, SwRI, visited James T. Hall, Chief, Prosthetic Division, VA Hospital, Houston, and showed lightweight leg brace (SWR-1) to see if they were interested in field testing.

16 January 1973 Tom Wooten, RTI, sent requested information on their problem on negative pressure chamber for problem UTM-40, Detecting Oxygen Toxicity in the Lung.

16 January 1973 Charles Yost, Dynamic Systems, wrote David Culclasure, SwRI, indicating that the T-foam being advertised is actually Temperfoam sold in bulk.

17 January 1973 Robert Wilbur, SwRI, telephoned Jeff Wright, JWM Corporation, to discuss symptons of cratered control unit on the complex coordinator.

17 January 1973 Jeff Wright, JWM Corporation, telephoned David Culclasure, SwRI, to arrange replacement for EPIC complex coordinator.

17 January 1973 John Sigmon, SwRI/MSC, requested information on ear oximeter from Ed Page, RTI.

17 January 1973 Robert Wilbur, SwRI, sent control console to Jack Arakelian, JWM Corporation, for repair.

18 January 1973 Jean Carter, SwRI, telephoned John Thielges, Ft. Worth, to inform him of status of complex coordinator machine we were going to have him come down to run evaluation studies on. The machine is being repaired but will contact Mr. Thielges when machine is ready to operate.

18 January 1973 Jean Carter, SwRI, wrote Weckesser Company, Chicago, to request samples and information on their nylon mounting studs and to inquire if they carried any special quick attach-release clamps or studs for reference on all the structural problems.

19 January 1973 A. G. Buck, Stanford BATeam, forwarded infomation on ICP telemetry indicating current efforts at Stanford to provide good pressure telemetry.

20 January 1973 John Sigmon, SwRI/MSC, delivered to Sam McFarland, SwRI, programmed automatic cuff inflator, EKG telemetry receiver and operations book for contourscope (WMC-2 and TCD-5).

20 January 1973 James Richards, Science Adviser to Governor of Texas, telephoned David Culclasure, SwRI to discuss several areas of possible team interface with state government.

22 January 1973 Jack Arakelian, JWM Inc., forwarded new complex coordinator to replace damaged unit.

23 January 1973 Jack Arakelian, JWM Inc., telephoned Robert Wilbur, SwRI, to discuss problem with complex coordinator. Determined the subassemblies are not completely compatible.

23 January 1973 Jeff Wright, JWM Inc., telephoned Robert Wilbur, SwRI, to discuss additional problems existing in complex coordinator. He is coming to SwRI to attempt to fix device.

23 January 1973 Jean Carter, SwRI, wrote F. A. Harris, University of Washington Medical School, Seattle, for additional input on "Bio-engineering Devices Used in Physical Therapy of the Athetoid Cerebral Palsied Child."

23 January 1973 Thomas Wooten, RTI, requested information concerning problem TVA-2 from David Culclasure, SwRI.

23 January 1973 Saleem J. Sheredos, VA Prosthetics Center, requested information concerning mobility aids and prosthetic devices worked on by the team.

23 January 1973 John Sigmon, SwRI/MSC, contacted Bob Scott, International Latex Corporation, about commercial source of bladder cloth.

26 January 1973 Jean Carter, SwRI, telephoned Lee Louden, Consultants Unlimited, to find out commercial status of visual sensitivity tester. They are presently producing the machines on a contract basis for $8000 for the machine and approximately $1000 for a x-y plotter. As soon as they receive scheduling from us on when to come to San Antonio, they will bring the machine with a technician for evaluation by our problem originator.

29 January 1973 Gordon P. Hungerford, Mobil Chemical Company, wrote David Culclasure, SwRI, expressing his desire to explore the possibility of marketing some of the NASA-developed rehabilitation aids.

29 January 1973 Wallace Barr, Charity Hospital of Louisiana, requested information on rehabilitation aids developed under the BAT program.

29 January 1973 Mr. Hesly, JWM Inc., telephoned Robert Wilbur, SwRI, to request that the device be returned to Philadelphia post haste since this is the only working unit and they need it for a demonstration.

29 January 1973 Robert Wilbur, SwRI, sent complex coordinator back to J. J. Williams, JWM Inc.

29 January 1973 Howard Vick, SCI, telephoned John Sigmon, SwRI/MSC, about equipment and information for NASA/MSC applications display.

29 January 1973 Mrs. Fischer, JWM Inc., telephoned Robert Wilbur, SwRI, to confirm the shipping of the coordinator. Requested billing number and flight information.

30 January 1973 Jean Carter, SwRI, telephoned Lee Louden, Consultants Unlimited, to make arrangements for him to accompany visual sensitivity tester for handling and calibration requirements to San Antonio February 19-20. The machine will be delivered to Col Simmons at Ft. Sam Houston for evaluation regarding problem BMC-7.

30 January 1973 David Culclasure, SwRI, provided Wallace Barr, Charity Hospital of Louisiana, with requested information on team's activities in rehabilitation.

31 January 1973 Jean Carter, SwRI, forwarded F. Thomas Wooten, RTI, requested Technical Support Package on TVA-2, Portable Cardiotachometer.

31 January 1973 Jean Carter, SwRI, forwarded Professor N. D. Greene, University of Connecticut, a copy of 1971-72 Final Report, copy of rehabilitation booklet and copies of dental research problem statements (UAD-3 and -7).

31 January 1973 Jean Carter, SwRI, forwarded Mrs. Virginia Marshall, Spokane, Washington, information on temper foam and daily assists for paraplegics per her request.

31 January 1973 Terry Tanner, Concept Inc., requested information from Robert Wilbur, SwRI, on the light detector and the shock detector. ConceptInc. is interested in manufacturing the light detector.

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

APPENDIX A
CURRENTLY ACTIVE PROBLEMS
STATUS CODE DEFINITIONS

A. Problem Definition

Problem definition includes the identification of specific technology-related problems through discussions with biomedical investigators and the preparation of function descriptions of problems using nondisciplinary terminology.

B. Information Searching

Information relevant to a solution is being sought by computer and/or manual information searching.

C. Problem Abstract Dissemination

An information searching has revealed no potential solutions and a problem abstract is being circulated to individual scientists and engineers at NASA centers and contractor facilities to solicit suggestions.

D. Evaluation

Potentially useful information or technology has been identified and is being evaluated by the team and/or the problem originator.

E. Potential Technology Application

Information or technology has been evaluated and found to be of potential value but has not been applied.

F. Follow-Up Activity

Useful information has been identified, but further activity (i.e., documentation, obtaining experimental validation of utility, continuing modification, etc.) is required.

G. Prototype Hardware

Prototype hardware has been sent to problem originator for evaluation.

APPENDIX A
CURRENTLY ACTIVE PROBLEMS

Problem Number	Status Code	Problem Title
AEB-1	G	Method for Identifying Denominations of Paper Money
AEB-2	F	Measurement of Physiologic Stress Parameters
AEB-4	F	Apparatus for Measuring Tactile Spatial Separation
AEB-5	B	Motion Sensor to Provide Biofeedback to Blind Persons Unaware of Involuntary Movements
AEB-6	B	Arc/Angle Measurement of Travel of Cane for the Blind
AVA-2	C	Carotid Artery Pressure Waveform Measurement
BLM-17	B	Improved Procedures to Measure Regional Blood Flow in Kidney
BMC-4	D	Improved Arch Support Material
BMC-7	E	Automated Device For Administering Visual Field Tests to Glaucoma Patients
BMC-8	B	Self-Generating Oxygen Supply
BUD-1	G	X-Ray Transparent Electrodes and Leads
CHS-10	C	Hearing Aid Malfunction System
CRH-1	D	Differentially Inflated Segmented Seat Cushion
CRH-2	B	Low-Friction, Porus Material for Orthopedic Collar
CRH-3	B	Means to Minimize Venous Pooling
CRH-4	B	Portable, Compact Breathing Machine
CRH-5	B	Improved Clamp for Urine Collection Device
CRH-6	B	Urine Collection Device for Incontinence in Female
DLM-14	D	Detection of Kidney Stones During Surgery
FTZ-1	E	On-Line Breath Analyzer

APPENDIX A
CURRENTLY ACTIVE PROBLEMS

Problem Number	Status Code	Problem Title
GLM-32	G	ECG Preamplifier for Home Tape Re corder
GLM-35	F	Beta Radiation Catheter Probe
GLM-43	D	Quick Attachment/Release Clamp
GLM-44	F	Quickly Adjustable Crutch
GLM-45	F	Material for Water Immersible Stretcher
GLM-46	F	Adjustable Cradle for Covering Burn Patients
GLM-47	C	Improved Stretcher Design
GLM-50	C	Catheter Support for Rehabilitation Patients
GLM-51	E	Pressure Telemetry Alarm for Hydrocephalics
GVA-6	D	Respiration Monitor
HSR-6	F	Sight Switch Operated Prehension Device
HUV-22	D	Automobile Driving Assist for Triplegic
IOU-1	B	Method for Measurement of the Amount of Humidity Present in the Lower Respiratory Tract
LLU-10	E	Non-Invasive Techniques for Measuring Oxygen Count in the Blood
LSU-1	D	Physiological Effects of Motion Sickness Drugs
LSU-2	D	Whole Body Radiation Measurement
LVA-3	D	Radioactive Microcell Counting Techniques for Diagnosis and Treatment of Leukemic Disorders
LVA-8	F	Abrasive-Resistant Plastic Material for use in Trace Element Research Programs
MHH-1	F	Rapid Id entification of Surgical Instruments

APPENDIX A
CURRENTLY ACTIVE PROBLEMS

Problem Number	Status Code	Problem Title
MSC-1	E	Portable Scalp Cooling Device
NMA-1	D	Program to Establish Electrical Safety Standards for Equipment and Instruments Used Around Patients
NMV-1	D	Control System to Permit Quadriplegics to Operate Long Playing Recording Devices
NUM-1	D	Methods for Interpreting Ultrasonic Doppler Blood Flow Velocity Signals
NUM-2	D	Measure Diameter of Femoral Artery by Ultrasonic Pulse-Echo Method
OCH-1	E	Plastic Long Leg Braces for Children
OCH-5	C	Failure Resistant Cerebrospinal Fluid Shunt
OCH-6	D	Sensory Hemiplegiac Stimulator
OVA-2	F	Measurement of Lung Compliance
OVA-4	F	Assessing Sleep Psychophysiology in Extreme Environments
PPR-1	C	Home Paging System for Reminding Elderly Patients of Medication Times
RNV-34	F	Pressure Sensitive Device for Use in Tongue Operated Control Systems for Artificial Organs and Wheelchairs
ROS-2	D	Method for Measuring Blood Gas Without Breaking the Skin
RRC-6	B	Lightweight, Portable Cushion Seat Jack for Weak or Paralyzed Patients
RRC-8	F	Ultra-Thin Electromyographic Needles
SLU-1	E	Elimination of Motion Artifact from EEG Leads in Pedestal Equipped Animals
SNM-25	B	Development of an In Vivo Blood Glucose, pH and pO_2 Analyzer

APPENDIX A
CURRENTLY ACTIVE PROBLEMS

Problem Number	Status Code	Problem Title
SWC-2	F	Cortical Audiometry Measurements
TCB-17	C	Acoustical Signal to Alert Blind Persons to Obstacles Between Waist and Head
TCB-18	G	Permanent Reflective Coating for Use on Canes for the Blind
TCB-19	C	Navigation Assistance to Keep Blind on a Set Direction of Travel
TCD-4	F	Noise Activated Flasher Warning for Deaf Driver
TCM-3	D	Peak Detector for Signal Conditioning of Blood in Basic Medical Research
TPR-1	G	Electro-Sleep Electrodes
TPR-2	B	Device to Correct Foot Pronation
TTU-1	D	Automated Instructional Activity Machines for Mental Retardates
TTU-2	D	Vocational Assessment Apparatus for the Physically and Culturally Handicapped Person
TTU-3	E	Rate Monitor for Self-Injurious Behavior
TTU-4	D	Nocturnal Activity Monitor
UAD-3	E	Determination of Tooth Vitality
UAD-4	D	Tooth Vitality Measured by Nerve Condition
UAD-7	E	Telemetry of Oral pH for Determination of Linkage to Cavity Formation
UAM-1	F	Capacitative ECG Electrodes
UAM-2	G	Heart Sounds Telemetry
UAM-8	D	Electrical Safety for Hospital Patients
UAM-13	E	Flexible Oral Transducer Matrix

APPENDIX A
CURRENTLY ACTIVE PROBLEMS

Problem Number	Status Code	Problem Title
UFM-7	E	Computer Analysis of the EEG
UOF-2	E	Low-Level Non-Invasive Blood Pressure Measurement
UOF-4	B	A Method for Determining Blood Coagulation by Phonocardiography
UTH-1	B	A Tactile Projector for Teaching Blind Students
UTM-25	B	Ionizing Radiation Detection of Thrombogenesis
UTM-31	D	Plastic Prosthetic Materials
UTM-32	D	Improved Design for Foot Supports
UTM-38	F	Improved Urethral Valve for Nonsurgical Implantation
UTM-39	D	Multi-Channeled Hypothermia Blanket for Heart Surgery
UTM-40	D	Detecting Oxygen Toxicity in the Lung
UTM-41	D	Measurement of Thrombus Adhesion to Blood Vessel Wall
UTM-42	D	Composites for Internal Biocompatible Protheses
UTM-43	D	Techniques for Characterizing Surface Roughness Under Electron Micrography
UTM-44	D	Detection/Measurement of Microbubbles or Microthrombi in the Blood
WMC-1	G	Plethysmographic Data Interfacing System
WMC-2	E	Identification of Korotkoff Diastolic Point
WMC-3	D	Optimum Methodology for Analyzing Cardiovascular Data

SOUTHWEST RESEARCH INSTITUTE
BIOMEDICAL APPLICATIONS TEAM

APPENDIX B
PLANS FOR UPCOMING MONTH

During the upcoming month, the following major events will occur, in addition to routine project work:

1. On February 5, the team will participate in a presentation to be made at the Veteran's Affairs Committe, House of Representatives, outlining the NASA Biomedical Applications Team program and demonstrating prototypes developed.

2. On February 13, the annual program review is scheduled, with NASA representatives visiting team activities at SwRI.

3. During the period 18-24 February, the Biomedical Applications Team exhibit will be displayed at the Annual Convention of the Society of Professional Engineers, in San Antonio, Texas.

4. On February 19, a representative from Ames Research Center will bring a prototype visual sensitivity for evaluation by Army Medical Service representatives at Brooke General Hospital, for applicability to glaucoma (and other) visual screening purposes.

5. The finalized prototype version of the money denomination identifier for the blind will be ready for delivery to the Problem Originator.

6. Efforts to have NASA Centers participate in the Applications Engineering efforts will continue. A number of technology applications are ready to be accomplished. However, attaining the applications is beyond the team's limited Applications Engineering budget.